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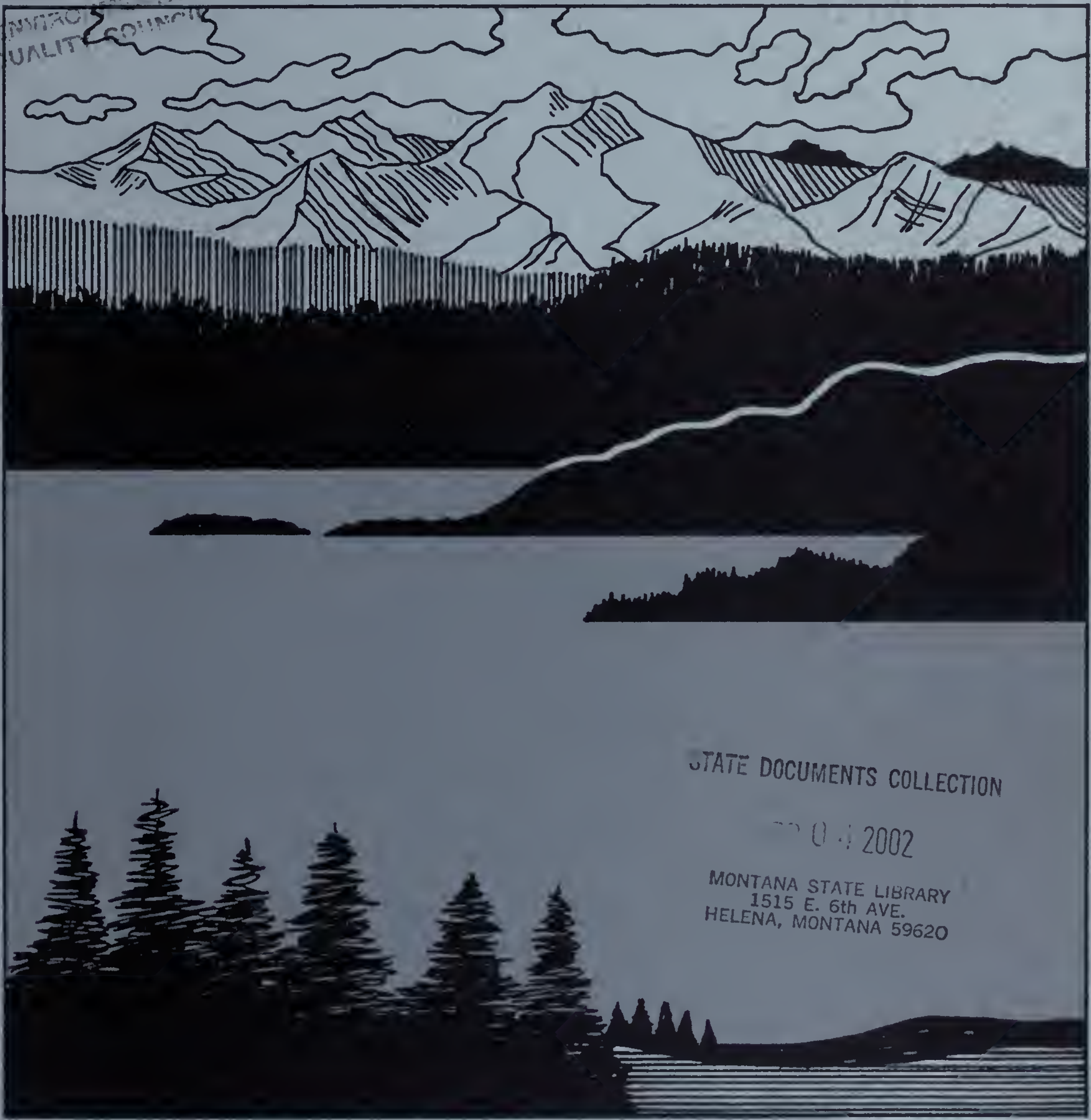
1989-1990 Biennial Report



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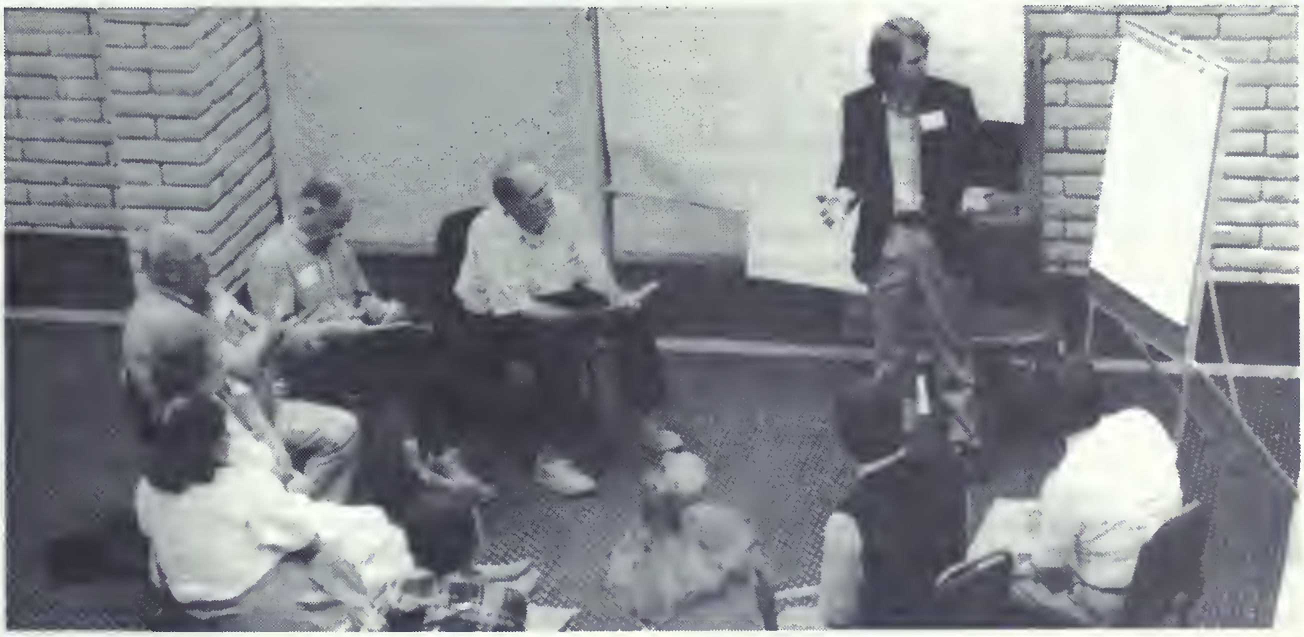
The beautiful Flathead area is a recreational paradise.



A facilitated group in action during the FBC's Community Planning Workshop.

Letter From The Chairman

Dear Governor Stephens and the Montana Legislature:

It has been a productive couple of years for the Flathead Basin Commission. Some of our highlights include:

- adding more citizen representation
- continuing with our public education program
- gaining ground on upgrading sewage treatment
- putting the Cabin Creek Mine to rest and initiating coordination and discussion with Canada about land use in the North Fork
- helping prepare a hazardous materials response in the aftermath of the Whitefish Lake oil spill
- sponsoring a study on forest practices
- conducting a successful workshop on land use planning.

The Commission has also maintained a basin-wide monitoring program which will keep all of us informed on the conditions of water quality in this special area of our State. Our efforts over the last two years are covered in more detail in this report.

The natural resource and economic issues and concerns in the Flathead seem to become more complex as time goes on. However, the citizens in the Basin are becoming more aware of the issues and are seeking a forum to address them in a fair and balanced manner. I believe the FBC has been successful and will continue to be an appropriate forum for public discussion of resource issues. Since most of the resource managers in our area sit on the Commission, it has become a model for promoting cooperative resource management.

On behalf of the Commission, I want to thank the Governor and the Legislators who have supported our work, and I ask for your continued support in the next biennium. There is a lot of work that needs to be done to overcome the often divisive positions on resource issues, and to move toward better utilization of our natural and human resources in a way that protects our water and enhances our economy. The FBC can be a very positive influence in that process.

The Commission looks forward to working with you over the next biennium and we are optomistic about maintaining the integrity of the Flathead as a very good place to live and to visit.

Sincerely,
Flathead Basin Commission
Jerald Sorensen
Jerald Sorensen
Chairman

Introduction

Both 1989 and 1990 were years of transition for the Flathead Basin Commission, and this biennial report documents the evolution of the FBC.

In 1989-90 Commission membership and leadership changed: Jerry Sorensen replaced Ed Brannon as chairman; Mark Holston replaced Craig Hess as FBC information officer/program manager; and the change of administrations in Helena meant a change in FBC executive directors, with Glenn Marx replacing Brace Hayden. All three of these individuals — Brannon, Hess and Hayden — served the Commission with distinction and the FBC is forever grateful and indebted for their commitment and contribution to the FBC and to the Flathead.

This biennial report, the third such report in the Commission's existence, is required by state law, yet it is a law with which the Commission enthusiastically complies. The FBC membership is committed to its missions of water quality monitoring and protection; encouraging cooperation among the basin's resource managers, encouraging international cooperation between the U.S. and Canada, encouraging economic development which does not compromise the basin's aquatic environment and holding public hearings concerning the condition of the Flathead's water quality.

The Commission has performed its duties faithfully, and welcomes an opportunity to illustrate this performance with a biennial report.

Make no mistake, this is indeed a Commission report. Virtually every member of the 21-member Commission assisted in the creation of this document. We, the members of the — of your — Flathead Basin Commission, take pride in presenting to you our third biennial report, which concludes the 1980s and leads us into the 1990s, a decade which holds great promise for the people and resources of the Flathead Valley.

Please Meet The Members Of The FBC

JERALD L. SORENSEN

The Chairman of the FBC, Sorensen is the Planning Director of Land Services for Lake County. An 11 year resident of the Polson area, Sorensen has been honored by the Governor's Citation for work on the Flathead Basin Environmental Impact Study. A member of the Montana Association of Planners and the American Planning Association, he likes baseball, hiking and reading in his free time. "I enjoy the dialogue and cooperation between the many resource managers and the public. I appreciate the willingness to work together."

H. GILBERT LUSK

Superintendent of Glacier National Park, Lusk has resided in the Flathead for almost five years. A veteran of over 25 years with the National Park Service, Lusk has been honored by receipt of the Department of Interior's Meritorious Service Award. He serves as a member of the University of Montana's School of Forestry advisory board and a member of the Kalispell Area Chamber of Commerce's Natural Resources Committee, among many community responsibilities. A computer hobbyist who likes hiking and golf, he sees the FBC as "An excellent forum for discussion of complex issues," and appreciates "working with an outstanding group of public and agency personnel concerned with and involved in current issues."

GLENN MARX

The Flathead Basin Commission's Executive Director, Marx is the Senior Policy Advisor on Natural Resource issues to Montana Governor Stan Stephens. A former Administrative Assistant to Eastern District Congressman Ron Marlenee, he has also served as Chairman of the Montana State Water Plan Advisory Council. A Helena resident, Marx is an avid, but ineffective, fisherman. Working with the FBC, he says, is an opportunity to serve with "A group united on a positive mission — the support of water quality."

LARRY D. WILSON

A self-employed lifelong resident of the Flathead area, Wilson resides near Polebridge, in the North Fork area of the Flathead River. A member of the Flathead County Planning Board, the North Fork Improvement Association and the District Six School Board of Trustees, he cites photography as his prime recreational activity. "Water quality is the key to Flathead County's future — only the FBC has all of the players and the political influence to protect that future."

ELNA DARROW

CEO of Kootenai Galleries of Bigfork, Darrow has resided at the north shore of Flathead Lake for over 20 years. Her involvement in environmental and development issues includes participation in such organizations as the Friends of the U of M Biological Station; the Montana Nature Conservancy; the Bigfork Development Company; and the Flathead Lakers, of which she serves as Vice President. "I like the opportunities for stimulating discussion and involvement in decision-making with people who are vitally interested in the area, but view it from many different perspectives."

ELWIN BENNINGTON, Ph.D.

A retired Captain from the U. S. Public Health Service, Dr. Bennington is a long time FBC member who has resided in the Polson area for 24 years. His community involvement includes membership in the Wilderness Society; Audubon Society, Montana Wildlife Federation, Union of Concerned Scientists and Polson Outdoors, among others. A hunting, fishing and boating enthusiast, he also enjoys gunsmithing and photography. "Working with the FBC is an opportunity to help improve and preserve a small but significant niche on planet earth."

CHARLES R. ABELL

President of the Whitefish Credit Union, Abell is a lifelong resident of Whitefish. A long history of community involvement includes duty with the Lakeshore preservation committee of the Whitefish City County Planning Board and the Whitefish school board. A nationally recognized powerboat racer, he also enjoys hunting and fishing. Serving as a FBC member "provides an opportunity to have meaningful input into the future of Northwest Montana."

Commission Membership 1989—

GARY G. BROWN

The Montana State Forester, Brown heads the Department of State Lands' Forestry Division from his office in Missoula. His long involvement in professional forestry has led to association with such organizations as the Society of American Foresters, the American Forestry Association and the Planetary Society. Canoeing, hiking and birdwatching command his free time. He enjoys "Working with the other members of the Commission to identify and help deal with the issues of the Flathead Basin."

JEAN M. CUMMING

A resident of Columbia Falls for over 40 years, Cumming was an early participant in Flathead-area environmental causes. As a member of GASP (Gals Against Smog & Pollution) in the late 1960s, she worked to improve the air emissions at the nearby aluminum plant. For many years an active fly fisherman and horse woman, she has explored virtually every drainage in the Flathead Basin. Of the FBC, she says, "It's an opportunity to take part in formulating recommendations for the ecological future of my area."

JOEL D. HOLTROP

A recently arrived resident of Northwest Montana, Holtrop is the new Supervisor of the Flathead National Forest. A member of the Society of American Foresters, he won a research assistantship at the University of Washington and has participated in an on-going series of continuing education programs through the SAF. Basketball, softball, hiking, camping and fishing command his leisure time. About serving on the FBC, he comments, "Working on items of extreme importance (water quality) in an open and constructive manner with people representing a wide array of backgrounds and values is very rewarding."

JoANN SPEELMAN

A life-long journalist, Speelman is currently a reporter for the Daily Inter-Lake of Kalispell. Her involvement in the community led to being honored with the "Great Chief" award, annually bestowed on an outstanding local resident by the Kalispell Area Chamber of Commerce. A member of Outdoor Writers of America, the Flathead Land Trust, the Glacier Natural History Association and other similar groups, she enjoys skiing, canoeing and photography in her free time. "Serving on the Commission is an opportunity to help protect the basin's water quality by working with all affected and involved parties."

MICHAEL T. PABLO

Chairman of the Confederated Salish and Kootenai Tribes, Pablo is a fifth generation rancher on the Flathead Indian Reservation. Recently named Chairman of the Montana/Wyoming Tribal Chairmen's Council, he has a long history of involvement in resource preservation and water conservation issues, including duty as a tribal delegate to the Columbia Basin Fish and Wildlife Authority, Chairman of the Tribal Shoreline Protection Board and Conservation District Supervisor for Eastern Sanders County Conservation District. "Serving as a member of the Flathead Basin Commission gives me an excellent opportunity to help preserve the quality of our most important natural resource in the Flathead — our water."

KENNETH H. KRUEGER

A former Flathead County Commissioner, Krueger is a Kalispell-area farmer who has lived in the Flathead for 40 years. Director of the Flathead Electric Coop and a member of the Montana Wheat and Barley Committee, he is an active hunter and fisherman. Service with the Flathead Basin Commission, he says, is "Working to keep the Flathead a good place to work and live, for our children and grandchildren."

ROBERT T. O'LEARY

An attorney with the Montana Power Company in Butte, O'Leary has been a part-time resident of the Whitefish area for 20 years. A former United States Attorney and member of the Montana Board of Pardons, O'Leary enjoys golfing and boating in his free time. "The FBC provides an opportunity to serve with a dedicated group representing different backgrounds and interests, but with a common goal of maintaining and improving water quality in the Flathead Basin, and fostering economic development consistent with water quality."

1990. . . New Initiative, New Enthusiasm

DENNIS J. CHRISTENSON

Project Superintendent of Hungry Horse Dam, Christenson is distinguished as being both the youngest superintendent for the Bureau of Reclamation and former head of maintenance for the largest dam in the U.S. (Grand Coulee). An avid pilot, hiker and fisherman, he is a three-year resident of the Flathead area. "Working with the FBC is a chance to observe other points of view and the education process involved. It's a way to see things accomplished that produce results in maintaining the quality of the Flathead Basin."

DAN VINCENT

The new Regional Supervisor of the Montana Department of Fish, Wildlife and Parks in Northwest Montana, Vincent is a member of several angling and sports-related organizations and enjoys hunting, fishing, raising four children and "gentlemen" farming. A new member of the FBC, he looks forward to working with what he sees as a "diverse group."

GEORGE E. ESKRIDGE

The Bonneville Power Administration Montana District Manager, the Missoula-based Eskridge is an active supporter of both American Legion and Little League baseball as a coach and board member. About serving on the FBC, he finds satisfaction "Working with local people who contribute their time voluntarily in making decisions and providing direction that involves their community economically and environmentally."

J. STEVEN FOSTER

A civil engineer and Assistant Chief, Planning Division of the Engineering Division of the Seattle District, U.S. Army Corps of Engineers, Foster busies himself with a variety of water resource duties, including service with the Washington Water Right Technical Committee and the Puyallup River Comprehensive Flood Control Committee. A baseball coach, biking enthusiast and skier, he says, "I feel proud to serve on the FBC and be a part of this expert group of forward-looking individuals."

RICHARD T. MONTGOMERY

A civil engineer with the Environmental Protection Agency's Helena office, Montgomery is a long-time member of the Water Pollution Control Federation and a Registered Professional Engineer. Currently building a home near Bigfork, he enjoys hunting, fishing and cutting and polishing gemstones. About his service on the FBC, he says, "I feel I am contributing to environmental sensitivity and protection of the Flathead Basin."

STEVEN L. PILCHER

Chief of the Water Quality Bureau of the Montana Deaprtment of Health and Environmental Sciences, Pilcher has been honored by the Izaak Walton League for Outstanding Conservation Efforts and received a Certificate of Commendation from the Association of State and Interstate Water Pollution Control Administrators. His hobbies include hunting, fishing, and showing and racing horses. "Serving on the Flathead Basin Commission allows me to work with other professionals and the public in carrying out common goals of protecting this valuable water resource," Pilcher commented.

The Priemer's Office, Province of British Columbia, Canada, is a liaison member to the Commission. A photo and biography of the liaison representative was unavailable when this document was prepared.

Executive Summary

The recent biennium was a challenging, rewarding, active and successful period for the Flathead Basin Commission. It was, as previously stated, a time of transition, a time of growth, and a time of accomplishment.

Early in 1989, during the Montana legislative session, the FBC was granted authority to expand Commission membership by five new members. The five additional members — appointed in September of 1989 — not only helped to ensure better basin-wide representation on the Commission, they also helped to infuse new enthusiasm and ideas into the FBC.

Also, early in 1989 the Commission voted to take on a new issue: land-use planning. While continuing the 1988-89 program of public information (in addition to the FBC-sponsored water quality monitoring throughout the basin), the Commission voted to stimulate community discussion and action to develop long-range community efforts designed to embrace basin growth and protect water quality. A central part of this report chronicles the Commission's work on this initiative. In addition, the report details the Commission's attempts to secure funding to implement the entire initiative.

> "We share a common bond
> and a common future"

The Commission also made progress on an old issue: bilateral cooperation between British Columbia and Montana on cooperative land management possibilities in the North Fork area, north and along Glacier Park's western border. Early in 1989, the International Joint Commission (IJC) ruled that development of a coal mine at Cabin Creek would violate an international transboundary treaty if allowed to proceed. The IJC also encouraged the Canadian and United States governments to pursue a cooperative agreement to establish joint management methods and priorities along the North Fork. The FBC has urged and stimulated discussions between Montana and British Columbia on this issue. The coal is still in the ground, and citizens of Flathead continue to watch with interest to see if a Montana-BC agreement can be reached.

The year 1989 will always be known in the Whitefish area as the year of diesel spill, a spill which triggered a renewed commitment to hazardous material response in the Flathead. On July 31, 29 Burlington Northern freight cars derailed and over 10,000 gallons of diesel oil spilled into Whitefish Lake. The immediate response to the spill, the long-term response to the issue of hazardous material response, and the FBC's role in this issue forms an integral part of the "Years in Review" portion of this report.

The purpose of this report is to inform the Montana state legislature, the people of the Flathead Basin and others about current FBC activities and future goals, and to as reliably as possible provide information about the status of water quality in the Flathead. A major section of this report details the FBC's continuing water quality monitoring of Flathead Lake, another portion updates progress on the Commission's Forest Practices/Fisheries/Water Quality Cooperative, and another portion provides a summary of the Water Quality Bureau's report on surface water quality in the Flathead.

In addition to presenting information about issues which involved the FBC and Flathead water quality during 1989-90, a section of the report looks at what issues the FBC may examine in the future.

"If you live in the (Flathead) Basin, there is a good chance that your livelihood or lifestyle depends on water quality."

The issue of sewage treatment, the innovative Crown of the Continent proposal, continued commitment to land-use planning, plus the System Operation Review of the Columbia River System are also issues which the Commission will monitor.

The Commission has no regulatory authority, and seeks none. The mission of the FBC is to monitor and protect water quality in the Flathead, and it is a mission we treat quite seriously.

In 1990 the FBC published a brochure which provided an outline of who the Commission is and what the Commission does. That brochure ended with these words:

> The environmental and economic future of the Flathead Basin is everyone's business. If you live in the Basin, there is a good chance that your livelihood or lifestyle depends on water quality.
>
> We encourage you to be informed and involved. Your voice can help shape the future of the Flathead.
>
> It is not simply up to government to protect our water. We **all** share the water resources of the Basin, and we share the responsibility in resource protection.
>
> We on the Flathead Basin Commission would like to hear from you. We welcome your involvement, your ideas, your comments and your support.
>
> We share a common bond and a common future.

You're encouraged to think of these words as you read the Commission's biennial report, a report written for the legislature and for the citizens of the Flathead area about the most precious resource commodity in the basin: clean water.

FBC - 1989/

The Flathead Basin Commission conducted a multitude of field tours, public workshops and meetings as well as issue-specific events in 1989-90. The photos on these two pages serve to illustrate the various projects initiated by the Commission.

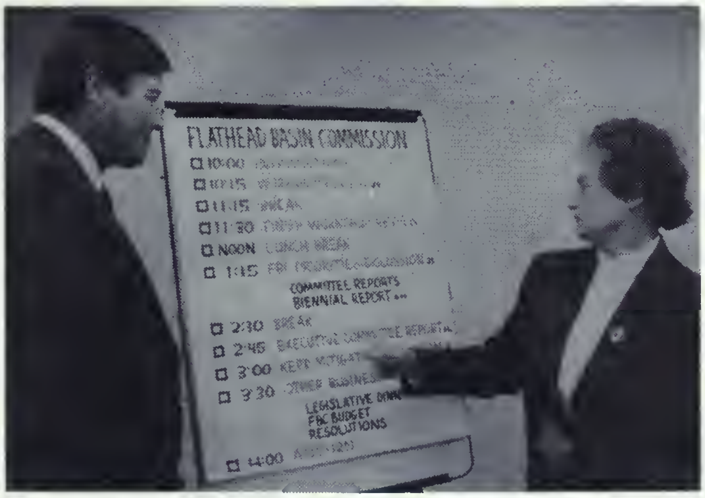
A featured part of the FBC workshop on community planning featured community discussion.

The FBC Workshop helped identify community values. One articulated here is "good comprehensive land use planning before it's too late!"

1990 Review

The Commission organized field trips to learn more about resource management in the Flathead. Here Glacier National Park and Forest Service officials review the impacts of the 1988 Red Bench Fire.

The Commission has an active interest in the correlation between water quality and fisheries management.



A typical FBC meeting agenda — discussed here by Gil Cook and Jean Cumming — focuses on several water quality issues.

Review. . . Headlines Help Tell The Story

It was a busy year for the Flathead Basin Commission. This small sampling of headlines illustrates the multitude of issues — and the depth and importance of those issues — addressed by the Commission.

Basin commission to push toward pact on North Fork

Basin commissioin publishes new pamphlet on area water

Basin panel to testify on Cenex well

Water conflicts

Basin commission learns how a dispute in Oregon was settled

Tour of North Fork is key to planning its future

Basin Commission eyes North Fork

Basin commission seeks five new members

Basin commission to discuss Kerr Dam

Basin panel goal: consensus on land-use and priorities

Pollution pamplets made available

Basin panel OKs funds to continue role in planning

Basin commission finds tribe fishing pact 'too hot'

Basin panelists call for widespread zoning

Basin commission seeks funds

Basin commission faces complex issues

Community workshop set by Basin Commission

First video on water issues debuts

Basin panel asks FEDC to back ecosystem center

Basin panel workshop draws community help

Oil spill leads to cooperative plan

Feds add $11,000 to the study of logging effects in Flathead

No dam stand Flathead Basin Commission remains neutral on Kerr Dam mitigation plan

The Flathead Basin Commission . . .

A process for focusing public concern – and action

Review. . . FBC Major Issues

The Basin Commission was involved in several major issues in 1989-90. The Review Section highlights some of those issues.

FBC Expands Commission Membership

In April of 1988, a two-day conference was held by the Commission on "Our Clean Water — Flathead's Resource of the Future." Attended by 215 people, the conference resulted in a series of recommendations from the attendees, including one to expand the membership base of the Commission, particularly to include additional citizen members.

A committee was appointed by the Commission chair on April 27, 1988 to review the conference recommendations and came forward with a proposal for consideration by the full Commission. The committee consisted of Brace Hayden, Jean Cumming, JoAnn Speelman, Craig Hess, Elwin Bennington, Bob O'Leary and Gil Lusk (Chair).

As finally approved by the Commission for recommendation to the legislature, the proposal consisted of expanding the Commission from 17 to 21 members. Voting members were increased to 13 by the addition of three non-affiliated citizen members. The ex-officio members were increased from five to seven by adding a new appointee from the Montana Department of Fish, Wildlife and Parks and by changing the status of the U. S. Bureau of Reclamation from liaison member to ex-officio member. British Columbia remained as the only liaison member to the Commission.

Legislation (SB-227) was passed unanimously in the Senate and House in 1989 and the bill was signed into law by Governor Stephens. Following enactment the Governor appointed three new voting members in September of 1989. The new voting members are Mr. Charles Abell, Whitefish; Mrs. Elna Darrow, Bigfork; and Mr Larry Wilson, Columbia Falls. The change was fully put into effect on October 20, 1989 when the new members attended their first Commission meeting.

Diesel Spill Prompts Community Action

The Spill

On July 31, 1989, a Burlington Northern freight train derailed and sent four tank cars down an embankment into Whitefish Lake at Mackinaw Bay. Of the 29 derailed cars, two leaked diesel oil directly into the water while three other cars on the east embankment vented potentially explosive isobutane, and another car leaked more diesel oil onto the west bank. According to Burlington Northern, the accident was caused when a dangling wheel snagged on a crossing switch, and that the derailment had nothing to do with the speed or handling of the train or the condition of the tract.

The local Disaster and Emergency Services director, Kim Potter, was notified of the spill about eighteen minutes after the accident. The spill became the responsibility of DES because it did not occur in any fire district, national or state forest, but on private land. Potter had to return to Kalispell from a training meeting at the airport to pick up the oil absorbent boom and the Search and Rescue amphibious boat. Potter arrived on the scene about noon. The county's two rolls of absorbent sheeting and 10 sorbent booms, and extra rolls and two more booms that arrived from Lake County, made up a boom that extended from south to north shore, across about one-third of the bay, about three and one-half hours after the spill. The oil slick began to proceed out into the lake about four and one-half hours after the spill.

About six hours after the spill, Bruce Sheppard, BN Environmental Engineer, arrived from Seattle on a charter flight with additional boom and other supplies. About two and one-half hours after arrival, the new boom had been placed in Mackinaw Bay.

At 2 A.M. on Tuesday morning (about fourteen hours after the spill) crews from Olympus Environmental Inc., set out an additional sea curtain, which stretched across the entire bay. By 2 P.M. clean materials started to run out. At 6 P.M. choppy waves from the southeast started to pound the sea curtain at the collection station, spilling streamers of oil outside the boom. Global Diving and Salvage pulled in another length of boom. At approximately 8 P.M., fresh absorbent supplies arrived at the city beach.

The State Department of Health and Environment Sciences worked with E.P.A. to form the scientific team which set standards as cleanup activity progressed. Teams from the Department of Health remained in place through all cleanup work and subsequently have done spot checks to verify the effectiveness of the mitigation work.

At 9:30 A.M. on Wednesday, Governor Stan Stephens arrived to view the wreck and oil spill. He authorized the state to hire a Portland, Oregon hazardous waste clean up firm that would help BN personnel and contractors.

At 3 P.M. on Thursday oil pumps had been located that could do the job and the damaged tank cars were empty at about 9:30 P.M.

On Friday at 5:50 A.M. the last tank car was removed from the Lake.

The Spill Results

Estimates of the quantity of diesel oil spilled into the lake ranged from 10,000 to 15,000 gallons. One of the first overflights estimated that a full one-quarter of the lake surface was covered with oil. The slick reached out of Mackinaw Bay across the lake to Carver Bay on the opposite shore.

Burlington Northern estimated that a total of 13,000 gallons was taken out of the lake, with 6,000 gallons being recovered free oil. Four days after the spill, the BN cleanup cost reached $1.2 million.

Despite the spill, no fish mortality has yet been observed. Fish collected in gill nets near Mackinaw Bay appeared to be in good condition. A small amount of crayfish and aquatic insects were killed in near-shore areas, and one duck was found dead in Carver Bay, apparently as a result of exposure to oil. Concentrations of benzene, toluene, and xylene present in Carver Bay area (WQB data) were much lower than concentrations required to kill fish (USEPA 1976).

The bottom water conditions in Whitefish Lake are such that oil is oxidized relatively fast (Edgerton 1987). Experts say the soluble oil components have a low tendency to be assimilated by bottom sediments. Water quality information collected by the Water Quality Bureau indicated that concentration of naphthalene, benzene, and toluene in the lake were lower than required to result in measurable accumulation by fish.

Mackinaw and lake whitefish were collected from the Mackinaw Bay area four days following the spill. Fillets from these fish were sent to the Food Science and Technology Department at Oregon State University for organoleptic testing. Data collected indicates that tainting of the flesh of fish is unlikely.

In addition, Fred Shewman, State Water Quality Bureau, said tests had pegged the contamination at one-fifth of EPA's limits for drinking water.

Following the spill, the State Department of Health and Environmental Sciences filed a lawsuit against Burlington Northern Railroad for violation of the Montana Water Quality Act and Public Water Supply Act. The suit specifically requests a comprehensive plan to cleanup the site and a plan to avoid future spills. The suit also seeks a $130,000 fine in civil penalties — $10,000 for each of the 13 days the spill kept swimmers and boaters off the lake, plus restitution for the state's expenses during the clean up operation.

The reality of an oil cleanup on water and shore line shows that only about fifty percent of the material can actually be recovered, and the rest of the spilled material is soaked up in absorbent materials which include soils and evaporation. A large oil film sheen is left, after all removal means are exhausted, which nature will take care of in time through microbial action and evaporation.

Also, about two to three thousand cubic yards of contaminated soil were removed from the spill site embankment area and is being "land-farmed" in the local area.

A year after the incident, a sea curtain boom has remained across Mackinaw Bay except when the lake has been frozen. The lake has almost rid itself of any signs of the accident.

Olympus Environmental, which is under contract with BN to monitor the spill site, has had an employee checking Mackinaw Bay about twice a week. Some major leaching of oil from the soil during spring runoff was expected and has diminished to a small sheen which requires continued monitoring and maintaining the boom in place. Plans for the future include keeping the boom in place after the ice thaw for the spring run off again in 1991. A well was drilled in the embankment area to monitor possible ground water contamination. To date no oil has been found in the well, but a diesel vapor smell has been documented.

Post Spill Action

Following the Whitefish Lake diesel spill, a group of administrative officials and concerned citizens assembled to present constructive examination of the spill and determine what should be done to prevent and respond to future occurrences of hazardous materials incidents. This initiated the public process known as the "After Action Phase."

On September 8, 1989, the response planning issue was expanded to include surface water protection for much of the Flathead River Basin. The Flathead Basin Commission (FBC) was asked to provide an "umbrella roll" as facilitator for future meetings.

On October 19, 1989, the FBC sponsored a public meeting in Whitefish where local, state and federal representatives responded to public concern.

Later, on December 8, interested persons met in Kalispell to review and clarify action items and to make assignments for follow-up working committees.

On January 19, 1990 the group met in Kalispell again and decided to organize themselves to become part of the Local Emergency Planning Committee (L.E.P.C.), which had been organized for Flathead County about two years earlier. The group had a strong consensus that planning should be done for future incidents and steps should be taken to see that the haulers of hazardous materials that come through the Flathead Valley are prepared to immediately contain their high potential accident spills and/or be re-routed. There was also strong consensus that all federal, state and county agencies should work and cooperate together due to the magnitude of some spills and that the amount of booms and absorbent materials required for a large spill is too much for one agency to stockpile.

The L.E.P.C. formed a study committee to specifically look at the problem of future spills and readiness to respond and limit the damage to the waterways in the Flathead Valley from impacting Flathead Lake. The FBC has two of its members on this committee and one permanent member designated to be on the L.E.P.C. The River Oil Spill Study Committee will report to the L.E.P.C. on the activities of this past year and make recommendations at the mid-January 1991 meeting.

The Threat Remains

The Flathead County Disaster and Emergency research indicates that thousands of tons of more than 200 hazardous chemicals are transported through the Flathead Valley each year. The Whitefish Lake residents were fortunate it was diesel oil that spilled into the Lake. Diesel No. 2 breaks down environmentally with sun, evaporation, and micro-organic activity.

Up to 1,400 tons of anhydrous ammonia are transported through the county twice each year by rail or on highways. If it had been ammonia, chlorine or rock salt that spilled in Whitefish Lake the result would be grim: the lake could be biologically dead today.

Recommendations

It was evident that no governmental agency was prepared to handle a spill the size of the Whitefish Lake oil spill. Manpower, materials, and money required to respond to such emergencies were all in short supply. Improved laws and regulations can be passed by government entities, but nothing is accomplished in reality unless funds are also granted to enforce and prepare the agencies to carry out the work. There is also concern that no one actually checks to see how effective an agency is accomplishing the will of the legislators. When supplies are needed rapidly an emergency fund does little good because of time-consuming problems associated with locating materials. Moreover, under current operations, purchasing and shipping take too long to be effective.

As a result of the Whitefish Lake oil spill the county has been given the sea curtain boom provided by Burlington Northern during the cleanup work and BN has stocked about $60,000 worth of absorbent materials in the Whitefish roundhouse. Fourteen counties through their respective Disaster and Emergency Services offices also have stocked a good supply of absorbent materials, and have compiled a list of all industries in their local areas who would also have a stock of absorbent materials.

The Flathead Basin Commission and the Local Emergency Planning Committee will continue its efforts in following through on the development of a first-of-its-kind protection, containment, and cleanup plan for the basin.

Governor Stephens helped coordinate the response to the Whitefish Lake diesel spill.

IJC: Thumbs Down On Cabin Creek Coal Mine

The Past

It was published in 1983: another technical government report about the Flathead. But this report was different. Instead of gathering dust on shelves, this report galvanized Northwest Montana and spawned the Flathead Basin Commission.

The report was titled the Final Report of the Flathead River Basin Environmental Impact Study (FRBEIS) and it concluded the following:

"The proposed Cabin Creek coal mine is the largest environmental threat currently facing the basin. The Steering Committee recommends that the U.S. State Department and the state of Montana call for careful scrutiny of the mine by Canada and British Columbia. The Steering Committee further finds that the mine as presently proposed, with its close proximity to Howell and Cabin Creeks, poses the potential for irrevocable harm to the downstream water quality and biological health of the Flathead Lake and River System."

The Flathead Basin Commission was created by the Montana Legislature in 1983, in part to specifically carry out the recommendations of the FRBEIS. One of the first tasks facing the new Commission was to work with the State to have the proposed Cabin Creek coal mine referred to the International Joint Commission, a bilateral organization which studies boundary issues between the United States and Canada.

In early 1985 the proposal was accepted as a reference by the IJC. A three-year study was initiated which included a Study Board and technical committees made up of U.S. and Canadian representatives. The Study Board gave its findings to the IJC in June 1988.

In December, 1988, the IJC issued its findings and recommendations.

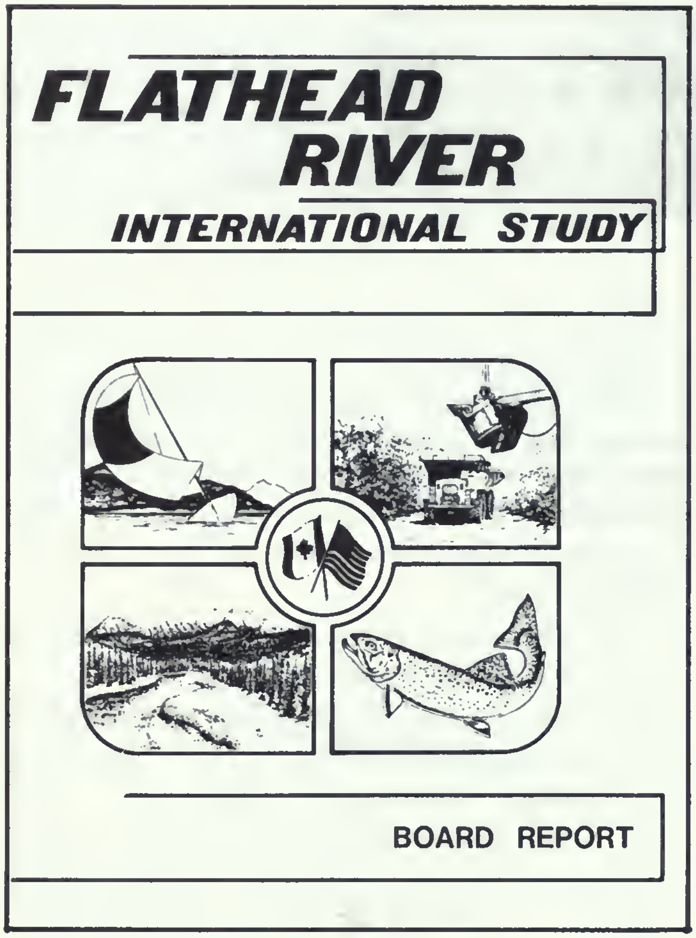
"The International Joint Commission recommends that, in order that Governments can ensure that the provisions of Article IV of the Boundary Waters Treaty are honored in the matter of the proposed coal mine at Cabin Creek in British Columbia:

(1) the mine proposal as presently defined and understood not be approved;

(2) the mine proposal not receive regulatory approval in the future unless and until it can be demonstrated that:
   (a) the potential transboundary impacts identified in the report of the Flathead River International Study Board have been determined with reasonable certainty and would constitute a level of risk acceptable to both Governments; and,
   (b) the potential impacts on the sport fish populations and habitat in the Flathead River system would not occur or could be fully mitigated in an effective and assured manner; and

(3) the Governments consider, with the appropriate jurisdictions, opportunities for defining and implementing compatible, equitable and sustainable development activities and management strategies in the upper Flathead River basin."

The U.S. and Canada, represented by Montana and British Columbia have initiated discussion on the recommendation of the IJC to consider defining and implementing sustainable development activities and management strategies in the upper basin. The FBC has spurred these discussions and is serving to facilitate a process to develop this recommendation.



FLATHEAD RIVER

INTERNATIONAL STUDY

BOARD REPORT

Toward The Future

For the past 18 months, representatives of the Flathead Basin Commission and the Stephens Administration have pursued the IJC recommendation with British Columbia officials.

Thus far, Governor Stephens has written to Premiere Vander Zalm in June of 1989 suggesting that a joint working group be established to examine a concept for developing improved methods of resource utilization that can assure sustained production and use in the North Fork Flathead Valley within Canada and Montana. Premiere Vander Zalm returned a letter in September 1989 expressing support for a process to examine resource utilization and to establish a working group.

In May, 1990, a delegation from Montana traveled to Victoria, B.C. to begin these discussions. Executive Director Marx and Chairman Sorensen were part of the delegation representing the FBC. Canada was represented by the Premier's office and the B.C. Ministry of Environment. At that meeting, it was decided that a starting place would be a tour for both parties of the Flathead Basin.

The tour took place the first week of October 1990. There were nine Canadian officials representing various ministries and nine American officials. Marx, Wilson, and Sorensen represented the FBC. One day was spent travelling through the Canadian portion of the drainage and discussing resource management. The second day was spent doing the same in the U.S. North Fork.

No formal actions were taken during the tour. At present, a summary of the tour and list of common concerns is being prepared by a U.S. and Canadian participant.

It is expected that discussions will continue with Canadian officials. The FBC will maintain an advocacy role, and hopes to have a formal working group established with members from Canada and the U.S. The FBC has also decided to designate one of their annual meetings to focus on international issues and seek participation from British Columbia.

> "The FBC will maintain an advocacy role,
> and hopes to have a formal working group established
> with members from Canada and the U.S."

Crown Of The Continent Plan Emerges

The Flathead Basin Commission has endorsed the concept embodied in the Crown of the Continent proposal.

Letters stating the Commission's action were sent to the Montana Congressional delegation, Governor Stan Stephens, the regional supervisor of the U.S. Forest Service, and the regional superintendent of the National Park Service. The Commission's endorsement also encouraged the Flathead Economic Development Corporation to take an active role in promoting the project.

A Basin Commission select committee, in reviewing the Crown proposal, suggested simplification to make the project goals and objectives more easily understood by the public.

Project Concept

The Crown of the Continent proposal calls for the creation of an innovative scientific and educational institution to initiate, coordinate, interpret and disseminate scientific research into the Crown of the Continent ecosystem and its links to the local community.

As envisioned by the proposal authors, achieving an understanding of inter-relationships which determine ecosystem integrity will serve as a prototype for making national and international resource policy decisions.

Resolution Conflict

The FBC select committee and full Commission has urged the Crown proposal to include as part of its goals and objectives research and data contributing to the resolution and avoidance of conflict. This concept is being included in updated versions of the Crown proposal.

Congressional Action

The FBC select committee also made suggestions to modify composition of the proposed Crown of the Continent board of directors. The makeup of this board ultimately will be determined in any enabling legislation adopted by the U.S. Congress.

The Crown of the Continent proposal has been placed before the Montana Congressional delegation where action is pending for funding of a feasibility study.

The FBC expects future opportunities to review the proposal as it begins to move forward in Congressional circles.

CROWN OF THE CONTINENT PROJECT

A Proposal for Integrated Research and Conservation of the Crown of the Continent Ecosystem in Montana, British Columbia and Alberta.

by

George F. Darrow
Former Montana State Senator and First Chairman of
the Montana Environmental Quality Council

Jack A. Stanford
Bierman Professor of Ecology and Director, Flathead
Lake Biological Station, University of Montana

H. Gilbert Lusk
Superintendent, Glacier National Park,
U.S. Department of Interior

Edgar B. Brannon
Former Supervisor, Flathead National Forest,
U.S. Department of Agriculture

Progress Made On Evergreen Waste Treatment System

In the interest of water quality, the Flathead Basin Commission has continued to encourage and support improvement of municipal waste treatment systems throughout the valley. Perhaps one of the most frustrating issues has been development of a collection system to serve the unincorporated community of Evergreen. This project has a long history of conflict and controversy dating back over more than ten years. Bond issues proposed to fund the project were twice turned down by the voters, even though a major portion of the cost was to be provided by a grant from the Environmental Protection Agency.

During the last two years the Commission has devoted special attention to promoting improved public understanding of present and potential water pollution problems related to continued use of septic tank and disposal field systems in the Evergreen area. This, together with threatened loss of grant support and increased efforts by State and County health agencies, finally led to approval of the project and necessary agreements in July of this year. The following is a summary of recent Kalispell newspaper headlines which gives a very descriptive chronology over the last year.

Evergreen OKs Kalispell sewer hookup proposal 5-23-89

Sewer proposal draws reluctant approval at Evergreen Meeting 7-18-89

New route seen for Evergreen sewer line 12-14-89

Evergreen gets block grant 1-15-90

Septic ban? High-tech systems to be required in Evergreen 2-5-90

Evergreen issue goes around one more time 4-3-90

Evergreen sewer funding imperiled by delay 6-20-90

Evergreen must meet Sept. 1 deadline or lose $3 million 7-5-90

'Final' Evergreen sewer plan done 7-5-90

Sewer SID has minor stall 7-30-90

Evergreen SID makes deadline by 2 minutes 7-31-90

Federal dollars safe for Evergreen sewer 9-2-90

Flathead Waters Still Look Good

Given the importance of water quality to the Flathead's economy and lifestyle, it is only natural that basin water be closely monitored and evaluated. In addition to the Commission's master monitoring plan, the State of Montana also has been evaluating the Flathead's waters.

Section 305(b) of the federal Clean Water Act requires each state to submit a biennial report to the U.S. Environmental Protection Agency describing the quality of its surface waters. The Montana Department of Health and Environmental Sciences, Water Quality Bureau, completed its most recent report to EPA in 1990 using EPA's new Waterbody Tracking System. This computerized system allows states to aggregate water quality assessment information on individual lakes and streams over an entire river basin. What follows is a report on water quality status — and sources and causes of pollution — in the Flathead Basin upstream from Polson, and compares this information to conditions statewide. The report was written by the Water Quality Bureau.

Streams

With 4.5% of the surface area of the state, the Flathead Basin upstream from the outlet of Flathead Lake has 4.8% of the stream miles in Montana (Table 1). However, whereas a full one-quarter of all stream miles in the state do not achieve full support of their beneficial uses, only about eight percent of Flathead streams are impaired to one degree or another, which means in a comparative sense the waters of the Flathead are higher in quality than waters in the rest of Montana. The 10 miles of Flathead streams that do not support their beneficial uses are the 10 miles of Ashley Creek downstream from the Kalispell Wastewater Treatment Plant.

Table 1. Support of designated uses in Montana and Flathead streams (miles).

Degree of Support	Montana	Flathead Basin
Full Support	34,808	2,254
Threatened	3,194	0
Partial Support	11,944	185
No Support	1,266	10
Totals	51,212	2,449

The report indicates that forest practices account for the largest **source** of stream pollution in the Flathead Basin, followed by natural sources, agriculture, land disposal (septic tanks and drainfields) and hydrologic modifications (Table 2). This reflects the relative importance of the forest products industry in the Flathead. For statewide stream pollution, forest practices rank fifth, with agriculture in the lead.

Table 2. Sources of pollution in Montana and Flathead Basin streams (miles).

Source	Montana	Flathead Basin
Agriculture	11,173	95
Natural	8,557	116
Hydrologic Modification	5,498	42
Resource Extraction	2,397	0
Forest Practices	1,690	129
Point Sources	1,444	29
Construction	1,267	16
Land Disposal	340	42
Urban Runoff	106	10

Siltation is the leading **cause** of stream pollution in the Flathead (Table 3). Suspended solids, nutrients, thermal modification, habitat alteration and pathogen indicators are also leading causes. Flow alteration, mainly stream dewatering for irrigation, is the leading cause of stream pollution statewide but only 39 miles or 1.6 percent of Flathead Basin streams are impaired by this cause.

Table 3. Cause of pollution in Montana and Flathead Basin streams (miles).

Cause	Montana	Flathead Basin
Flow alteration	7,100	39
Suspended Solids	6,973	178
Siltation	6,317	190
Salinity	5,741	0
Nutrients	5,601	123
Habitat Alteration	4,821	74
Other Inoranics	4,667	0
Metals	3,772	0
Thermal Modification	2,526	88
Pathogen Indicators	1,609	67
Organic Enrichment	847	22
pH	713	26
Ammonia	377	10
Noxious Plants	155	10

All but 10 miles of Flathead streams are fishable and swimmable (Table 4). These are the same 10 miles of Ashley Creek downstream from the Kalispell Wastewater Treatment Plant. For a detailed description of other impaired streams in the Flathead Basin, consult the 1990 305(b) report available from the Water Quality Bureau, Cogswell Building, Helena, Montana 59620.

Lakes

While the Flathead Basin comprises less than 5% of the surface area of Montana, it has more than one-quarter of the state's acres of lakes and reservoirs (Table 5). Flathead Lake accounts for nearly three-quarters of the lake acres in the Flathead Basin.

Three lakes — Echo Lake, Hungry Horse Reservoir and Lake Mary Ronan — only partially support their designated uses. Flathead Lake and Whitefish Lake fully support their designated uses but are threatened by one or more sources of pollution. The remaining lakes in the Flathead Basin provide full support to their beneficial uses, although not all of the Flathead area lakes are included in the Waterbody Tacking System.

Table 4. Clean Water Act goals in Montana and Flathead Basin streams (miles).

Goal/ Attainment	Montana	Flathead Basin
Fishable	38,474	2,254
Partly Fishable	11,565	185
Not Fishable	1,173	10
Not Attainable	0	0
Swimmable	46,096	2,356
Partly Swimmable	4,536	83
Not Swimmable	579	10
Not Attainable	0	0

Table 5. Support of designated uses in Montana and Flathead lakes (acres).

Degree of Support	Montana	Flathead Basin
Full Support	31,313	17,697
Threatened	137,627	129,357
Partial Support	449,114	24,065
No Support	14,651	0
Totals	632,705	171,119

As with streams, forest practices account for the largest **source** of lake pollution in the Flathead, followed closely by hydropower production (Table 6). Statewide, forest practices and hydropower rank fifth and fourth, respectively, as sources of lake pollution.

Table 6. Sources of pollution in Montana and Flathead Basin (acres).

Source	Montana	Flathead Basin
Agriculture	378,448	2,066
Natural	338,460	2,066
Hydropower	299,629	21,999
Forest Practices	36,292	23,519
Construction	15,122	0
Land Disposal	9,708	2,066
Point Sources	5,100	0
Resource Extraction	1,600	0
Urban Runoff	546	546

The report also suggests that siltation and suspended solids are the leading **causes** of lake pollution in the Flathead, with lake level alteration a close second (Table 7). In recent years Hungry Horse Reservoir has experienced severe drawdown, which tends to promote shoreline erosion and sedimentation in the lake. Statewide, lake level alteration, suspended solids and siltation rank first, third and seventh as causes of pollution in lakes. Nutrients are the leading causes of pollution (eutrophication) in Echo Lake and Lake Mary Ronan.

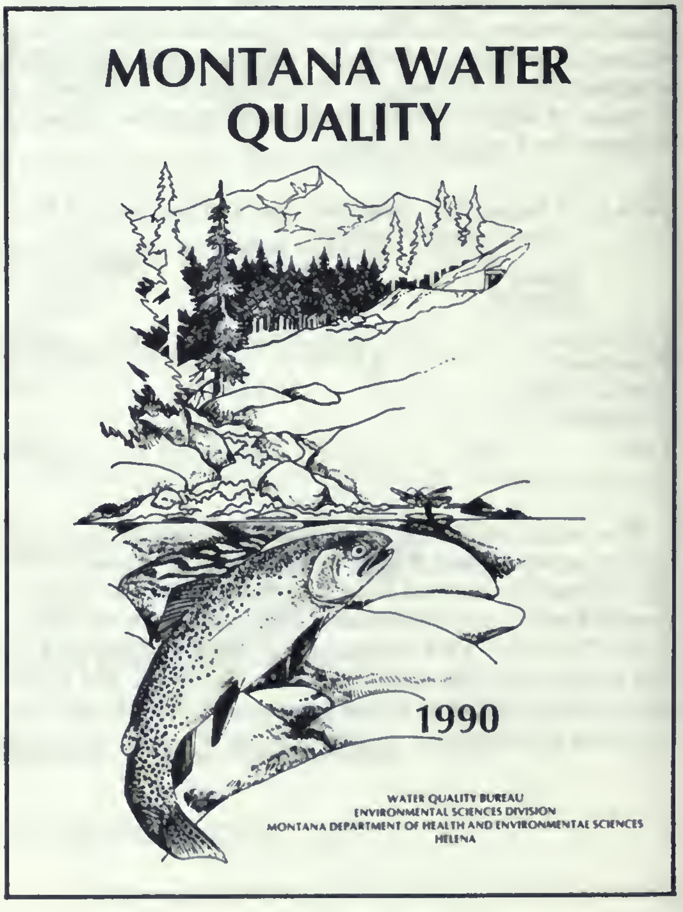
Table 7. Causes of pollution in Montana and Flathead Basin (acres).

Cause	Montana	Flathead Basin
Lake Level Alteration	363,221	21,999
Nutrients	319,316	2,066
Suspended Solids	310,845	23,519
Metals	306,242	0
Noxious Plants	306,019	0
Organic Enrichment	257,022	0
Siltation	79,142	23,519

All of the lakes in the Flathead are fishable and swimmable (Table 8). Taken as a whole, Flathead waters continue to remain among the purest and most pristine in Montana. The threats to this purity, however, continue to persist. For more information on the water quality status of Flathead Basin lakes, see the 1990 305(b) report available from the Water Quality Bureau, Cogswell Building, Helena, Montana 59620.

Table 8. Clean Water Act goals in Montana and Flathead Basin lakes (acres).

Goal/ Attainment	Montana	Flathead Basin
Fishable	226,475	147,054
Partly Fishable	392,977	24,065
Not Fishable	13,253	0
Not Attainable	0	0
Swimmable	288,934	169,053
Partly Swimmable	332,619	2,066
Not Swimmable	11,151	0
Not Attainable	0	0



MONTANA WATER QUALITY

1990

WATER QUALITY BUREAU
ENVIRONMENTAL SCIENCES DIVISION
MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
HELENA

FBC Planning Initiative. . .

LAND-USE PLANNING INITIATIVE

In early 1989, the FBC voted to actively pursue a community land use planning initiative designed to protect water quality now and in the future.

The vote underscored the realization that everything we do on land impacts the quality of our water.

The document which best articulates the purpose for the FBC's initiative is the "Building A Better Community" grant application written by FBC membership in conjunction with the Freshwater Foundation. While the Commission has thus far been unable to secure the funding needed to financially support the entire initiative, the FBC has sponsored a community workshop and is aggressively seeking funding and plans to implement the basic agenda of the initiative.

What follows is an edited, partially-summarized version of the FBC's grant application. The Commission has made a major investment of time, effort and funding to accomplish what follows:

PROBLEM AND PROPOSAL

It is ironic, but the natural resources that make the Basin so individually spectacular are also its Achilles Heel. Flathead Lake rests in the heart of the Flathead Basin. Nowhere in the world will you find such a freshwater jewel cast in more intriguing and remarkable surroundings. The lake is bordered by Glacier National Park, Flathead National Forest, the wild and scenic North Fork of the Flathead River, Canada, the Flathead Indian Reservation, the Bob Marshall Wilderness Area, a major water reservoir at Hungry Horse and a power generating plant at the outlet of Flathead Lake.

The Basin's pristine waters' and celebrated recreation were once America's best kept secret. Now, that's all changed as nearly two million tourists pour into the Basin each year and spend over $195 million annually. And these numbers are expected to rise dramatically.

Another trend has developed: increasingly, these people do more than visit. They stay. In the last decade, the Flathead has seen a 15 percent growth in population — five times Montana's state average and one of the most rapid growth rates in the Rocky Mountain West.

Most of the population growth has occurred in the rural areas close to the natural amenities and where acceptance of planning and the necessary support for effective planning implementation has been lacking. It is determined that 80% of the land divisions in rural areas in Flathead County are done with no planning review; in Lake County the figure is 50%. As a consequence, the rural lands are being developed in a haphazard manner with little regard for protection of resource values such as water quality, wildlife, agricultural lands, riparian (bank of a stream or lake) zones, and scenery.

There is a growing level of concern that the existing local government processes are not working to ensure protection of resource values or a sustainable plan for the future of the area. There is a lack of shared vision and coordination among the various governmental officials, and a lack of trust between these officials and the public.

In the Basin's complex land patterns, planning has become as "jigsawed" as the multi-jurisdictional authorities. While planning efforts exist in the Basin, there is no accepted organization to coordinate planning. As a result, the lack of effective implementation makes planning essentially "dysfunctional" and it is water quality that is paying the price.

THE FLATHEAD BASIN:
A Setting That Demands Action

- The largest natural freshwater lake in the western United States
- 291 miles of designated Wild and Scenic Rivers
- One of America's finest wilderness areas
- One of the most popular national parks, recognized as a United Nations Biosphere Reserve, and selected for World Heritage nomination as the Waterton-Glacier International Peace Park, the first of its kind in the world.
- World class trout streams and prolific lake fisheries

. . . Looking Ahead to Basin's Future.

Everything We Do On Land. . .

ALSO

- Demand for timber
- Oil and gas exploration
- The fastest growing area in Montana
- Intensified demands on water for recreation and fishing, agriculture and industrial power generation

The Flathead Basin in northwest Montana contains natural resources unmatched anywhere in America.

Isolated, but no longer remote, the Flathead area can still boast of an impressive accomplishment: water purity that other areas of the country have tried and failed to protect is still protectable in the Flathead.

The Flathead is a victim of its own splendor. Because the Flathead Basin, the last and best of what's worth saving in this country is in danger of being loved to death.

The threat is real, and it is immediate. There is growing awareness and concern that the myriad of local/state/federal governments possess the ability but lack the coordination required to handle this threat.

"COORDINATE THIS MESS!"

According to a frustrated local county planner, multi-jurisdictional authority has created uncertain and uncoordinated planning efforts in the Basin. "Someone," he has said, "needs to coordinate this mess." In the Flathead that someone is the Basin Commission.

The Commission can create an environment to develop innovative approaches which will achieve community involvement and acceptance, plus governmental approval and interest group support.

The waters of the Basin are threatened, and the future may contain not just threats, but the actual loss of water quality. The Commission is convinced that Basin waters should be protected now — not polluted then cleaned up. With proper planning acceptance, we can embrace, protect and defend the natural resources that attract economic development.

COMMISSION COORDINATION

To fulfill these objectives, the Commission proposes to undertake the following action:

- Identify and establish a range of community values
- Illustrate the strengths and weaknesses of existing planning practices
- Create coordination of the multiple and complex resource management authorities into a planning process, including the National Park Service, Flathead National Forest, Confederated Salish and Kootenai Tribes, the Montana Department of State Lands, Flathead County and Lake County.
- Establish a process for dialogue and mediation between various interest groups and governmental agencies on sensitive environmental and economic issues. Some issues to be examined are:
  - a) residential, commercial, and industrial development
  - b) timber harvest
  - c) tourist and recreational development
  - d) oil and gas development
  - e) water use and allocation
  - f) tribal treaty rights
  - g) hydropower and flow regimes
  - h) the management of hazardous materials
  - Prepare a community-generated vision that outlines a planning process based on shared values. This document will address sensitive natural resource issues. The document is intended to be used by elected and administrative officials at the Federal, State, Tribal, and local levels
  - Using this vision and the community support generated this method, the Basin Commission will secure 'buy-in' by the various resource managers and public to achieve an effective, coordinated land use planning process in the Flathead Basin
  - Using an accepted process and a generated public support, a Commission objective is to secure sensible, reasonable and objective facilitation and implementation of planning into the decision making processes of management and government

. . . Can Impact Water Quality

Water Quality. . .

PROJECT ACTIVITIES:
The Community "does the work"

The Basin Commission is a non-regulatory entity, with no actual authority. Success, whether at the state legislature, with local governments or bilateral agreements, derives from a three-step process:

- Identification of situations and education about the severity/importance of a problem,
- Working with the community to develop a plan of action.
- Working through the community to solve the problems by implementing the action plan. This initiative is tailored to this proven process.

ACTUAL PROJECT ACTIVITIES

Education

- Kick-off symposium (Fall 1990)
- A Basin-wide Opinion Poll will be conducted to determine values and attitudes.
- A series of Small Community Meetings.

Development

- A Workshop to develop the Action Plan will be organized.
- The Draft Action Plan will be presented at community meetings.

Implementation

- A Final Action Plan will be completed.
- The Action Plan will be implemented through community/political support (Summer 1992).

PROGRAM BUDGET

A combination of local contributions, philanthropic foundation support and in-kind services will be required to fund the program.

Outside Funding Needs	
Educational Forum	$ 5,000
Opinion Poll	11,000
Community Interaction neighborhood meetings, slide show, brochures, video, secretarial, editorial	**28,000**
Final Report to Community	**4,000**
	$ 48,000
Local Commitments	
State of Montana (program coordinator)	$ 25,000
Flathead County (space & occupancy costs)	3,000
Flathead Basin Commission (program development)	8,000
Flathead Lakers, Inc.	1,000
Flathead County	500
Local Contributors (unsecured)	8,500
Columbia Falls Aluminum Company	2,000
	$ 48,000
Total Project Costs	**$ 96,000**

BUILDING A BETTER COMMUNITY

Toward a Common Vision

Project Manager:

Jerry Sorensen
Chairman
Flathead Basin Commission

Flathead and Lake Counties, Montana

. . . Quality Of Life

Today's Decisions. . .

THE FBC COMMUNITY WORKSHOP

Providing for economic well being while ensuring environmental quality: that was the challenge that drew over 125 Flathead-area residents to participate in a one-of-a-kind day-long workshop in Kalispell on September 26, 1990.

A kick-off for the Flathead Basin Commission's two year planning initiative, the workshop was designed to provide a snapshot of public thinking at the beginning of the new decade and help identify those values, obstacles and processes that will shape the Flathead of tomorrow.

Under the banner "Today's Decisions — Tomorrow's Results," the series of addresses, panel discussions and working "breakout" sessions invited professional managers and planners to sit side-by-side with concerned citizens. The goal: to reach consensus on what decisions can be made today that will lead to a more economically secure and environmentally sound tomorrow in the Flathead Basin area.

Specifically, the workshop served as an opportunity to examine the status of established processes that guide change in the area, express values held by Flathead-area residents, and identify priority needs and approaches to community decisions that will produce tomorrow's results.

With residents from both Flathead and Lake counties in attendance and a wide assortment of public officials, opinion leaders, and officials from organizations directly tied to the process of implementing and directing community change, the workshop succeeded in helping to clarify perceptions and sharpen concepts for dealing positively with coming change.

The following excerpts from presentations made during the workshop exemplify the attitudes, opinions and positions of key leaders who will help shape public thought on issues of the economy, the environment and planning in the future.

Karen Barclay, Director of the Department of Natural Resources and Conservation, State of Montana, representing Governor Stan Stephens:

> **"Water quality is clearly the dominant issue in the Flathead. I think the questions we all must ask ourselves are, can the Flathead Basin build upon its resource-based economy, protect its extraordinary natural resources and quality of life, and yet find new economic opportunities for its residents? I believe the answer to all these questions is 'Yes." And I also believe the key to successful water planning lies in the active support and involvement of people who use, enjoy and manage the water resources.**
>
> **The public must understand the process and believe it is fair and reasonable for solving problems and eliminating conflicts."**

Jerry Sorensen, Chairman, Flathead Basin Commission:

> **"Historically, planning and land use regulation has been a very unpopular subject in the political arena in the Flathead, but we felt it could not be ignored in light of the duties of the Flathead Basin Commission. I am pleased and feel it is significant that many others are now talking about our future and the need for better land use planning in the Flathead."**

The Honorable Bart Erickson, District Court Judge:

> **"I suggest we need comprehensive county-wide planning. I suggest we need a willingness by regulators to not only regulate, but also to accommodate. I think that between education, a willingness to assist, and proper planning, the Flathead has a very good chance of remaining 'The Last Best Place.' "**

Steve Herbaly, Flathead Regional Development Office:

> **"We're never going to be able to stop change. This is one of those places people are going to come to. Change is inevitable, and unless we, the people who are here now, make the decisions and clearly spell out what those values are that we're willing to accept regulation to protect, those values will be lost."**

Carol Daly, Flathead Economic Development Corporation:

> **"What we're not seeing and what we're not dealing with is the real structural change in the U.S. economy. If we don't deal with it here in Montana, and particularly here in the Flathead, we're going to be left in an economic and social backwater. There is no 'They' that's going to come and do the planning for us — it's us, and unless we focus on 'Us' as being the ones to create the answers, then we're really missing the boat."**

Tim Grattan, Whitefish resort owner and land developer:

> **"We can't compromise the basic strengths this area has — the assets of water, air, and the scenery. Change is inevitable. We've got to try to get ahead of it. We can't continue to be knee-jerk reactive. We've got to be pro-active. We've got to plan. So far, the planning has been good, but it needs to be more intense, more specific and it needs to have more involvement."**

Jim Thompson, architect and backer of the arts community:

> **"The bottom line is, we're going to attract more people, and we have to protect our environment."**

Larry Wilson, Polebridge resident and businessman:

> **"We are surrounded by change. It's going to get worse — it's not going to get better. If we are to have a liveable place ten years from now — twenty years from now — we must plan now, we must protect our water. And if we protect our water, we have a chance. If we just let it slide, the quality of life here in ten or twenty years won't be worth any more than downtown L.A."**

. . . Tomorrow's Results

A Community Plan. . .

Dick Wollin, Polson resident and President of the Flathead Lakers:

> **"Those who use water have the responsibility to put it back in the system as good or better than they took it out. That's the stewardship involved. Keep in mind that water is life, and without water that is usable, life is in jeopardy. What stronger single incentive can there be than the preservation of life. We must be convinced that the crisis is now, and that people must act now, that you must change now."**

Marty Jessen, President and CEO, the Freshwater Foundation:

> **"If the Flathead Basin Commission's vision of clean water is to be realized, then standards must be developed for the many land uses that impact it — wilderness to industry. Water is a shared resource, not a commodity to buy and sell, like cattle. We use and reuse water, and what your neighbor does to it will impact you."**

In the inter-active portion of the Workshop, the 100 or so participants were divided into six working groups to spend several hours considering community values and obstacles to change. They were also charged to identify opportunities that might be able to help facilitate responsible change and pinpoint those processes that will likely influence the pattern of change. Finally, the working groups were asked to propose Action Items — those methods through which effective mechanisms can be employed to help build the broad-based community support needed for progressive, responsible planning initiatives in the Flathead Basin.

The six groups found many similar factors. Among the values most frequently cited were what was identified as "small town values;" the high quality of the environment at the present; lack of congestion; low cost of living; economic, cultural and biological diversity; and the unique quality of the surrounding ecosystem.

Obstacles to proper growth identified by the groups included such things as the conflict between personal interest and the public good; lack of enforcement of laws and regulations; insufficient public education on environmental concerns; lack of funds; and what was variously tagged a "frontier spirit" or the independent mind-set that favors strong individualism and thwarts community actions.

Opportunities to help remedy the problem included: pro-active planning; educational strategies to help influence young people; the creation of community "round tables" to facilitate discussion of planning, development and environmental issues; the ability to utilize the Flathead Basin Commission and other organizations to work toward the goal of responsible growth and environmental protection; and the challenge of stimulating public interest by making the processes more accessible.

Processes that influence change were identified as the media; agencies involved in resource management and decision-making; heightened public participation; availability of more funding to help effect change; legislative initiatives; and an array of economic factors, including taxation, employment and the future of traditional industries like forest products and agriculture.

Finally, the action items proposed by the six working groups included implementation of county-wide zoning; basin-wide land use planning; improving education and communication at all levels; the centralization of information concerning regulations, permits and other development related matters; establishment of community "round tables" to facilitate citizen interest and input; and the future involvement of the Flathead Basin Commission to coordinate education and research.

The workshop's addresses, panel discussions and public interaction were video-taped, and the production has been programmed on Flathead-area cable access. In the future, the same programming will be made available to the Mission Valley public TV facility at the Salish and Kootenai Community College for airing in the Lake County area.

Various kinds of printed materials will be produced to help facilitate an on-going discussion of the points identified by the workshop participants. Those will be used in concert with the Basin Commission's schedule of public speaking opportunities and educational outreach efforts. The goal is to capitalize on the consensus of thought refined at the workshop and continue the larger effort of educating the public as to the interrelation of the economy and the environment and the need for land use practices that will insure high water quality into the future.

Trig Kvande helps identify community values.

. . . To Protect The Basin's Future

FBC's Forest Practices/Fisheries/Water Cooperative Program

Termed "An Experiment in Collaborative Problem Solving" when it was initiated in the summer of 1988, the Forestry Practices Cooperative Program has completed its research stage and will soon produce a working document that will supply heretofore unavailable baseline data essential to the conduct of environmentally responsible timber harvesting practices. The Cooperative has the potential for a significant spin-off benefit: achieving a new level of understanding and cooperation between the timber industry and those agencies charged with protecting essential natural resources.

Specifically, logging practices and construction activities (building of logging roads, etc.) have long been viewed as threats to water quality and fisheries habitat. The purpose of the Cooperative is to provide a baseline of information that is acceptable to the major "players" in resource management and protection. The Cooperative, if successful, should focus the timber harvest/water quality debate on facts instead of emotion.

The Cooperative grew out of a decision by the Flathead Basin's primary land managers — the Flathead National Forest, the Montana Department of State Lands and Plum Creek Timber Company — to seek a cooperative effort by state, federal and private interests to investigate how forest practices effect water quality and fisheries in the Flathead Basin. Ultimately, a broad based coalition of other organizations was brought into active involvement. These include the Flathead Basin Commission; the Montana State Water Quality Bureau; the State Department of Fish, Wildlife and Parks; the Environmental Quality Council; the University of Montana, through its Flathead Lake Biological Station and the Missoula campus-based School of Forestry.

Throughout the process, the Flathead Basin Commission has functioned as a facilitator between resource managers, governing authorities, the scientific community and the public.

The program is based on eight study modules. The stated objective of the program is to use existing data in combination with research findings to examine the current situation, while the data and analysis will further provide an objective basis for defining additional monitoring studies as well as modifying current practices, where warranted.

Briefly, the eight areas of study are:

1. Site Survey and Field Audit. Using techniques developed for the Montana Environmental Quality Council's logging study, the objective is to review completed timber sales and evaluate the success of the use of BMPS — "best management practices" — to prevent watershed erosion problems.

2. Watershed Risk Assessment. A review and refinement of computer-based programs currently used to assess changes to a particular watershed because of timber harvesting and road building activities.

3. Geographic Information System Application. To develop computer geographic display capabilities for the watershed risk assessment model. This information base will help plan future management strategies for individual watersheds.

> "Throughout the process, the Flathead Basin Commission has functioned as a facilitator. . ."

4. Riparian Vegetation Management Guidelines. To develop management guidelines, or "recommended practices," that are specifically tailored to the habitat types and riparian (relating to the bank of a stream or lake) areas found in the Flathead Basin.

5. Historical Records Correlation. An effort to assemble and statistically examine the relationships of the water flow, logging history, weather and fire history data for the Flathead Basin, back to the turn of the century.

6. Watershed Ecosystem/Logging Effects. An instream study to measure specific changes in watershed ecology (biology, chemical and physical characteristics) as a result of forestry practices. The streams evaluated will be both natural and within timber-harvested watersheds. This study will focus on applying known published findings to the specific landscape types found in the Flathead Basin, as well as capitalize on research findings of the Biological Research Station in monitoring changes in Flathead Lake.

7. Fisheries Habitat/Sediment Effects. An examination of cut-throat and bull trout habitat and how changes in instream sediment conditions are important to these specific fisheries. The study has extended the current cooperative efforts between the Department of Fish, Wildlife and Parks and the Flathead National Forest.

8. Stream Reach Inventory. Identifies stream pollution sources for a representative group of streams within the Flathead Basin.

To tie these individual efforts together, the study leaders have participated in "linkages discussion" to help produce a summary document that will be used by current land managers. The end result will be a series of specific recommendations for future monitoring.

At this time, most of the research for the Cooperative Program has been completed and is in the initial stages of being edited into a final summary draft document. That document will be completed by May 15, 1991, and prepared for printing and distribution.

Both the cooperative spirit of this effort and the promise of significant and useful scientific data for future functional use have highlighted this two and one-half year effort. To quote Ed Brannon, former Supervisor of the Flathead National Forest and former Chairman of the Flathead Basin Commission, "A spin-off of this project has been an increased understanding and cooperation among the agencies in this group — on water quality as well as other issues. If the next two years of this project progress as well as the first year, the water, land and people of the Flathead Basin will benefit greatly from this effort."

The cooperative will reach a successful conclusion in May 1991 thanks to the participation of financial contributions of the following cooperators

Plum Creek Timber Company	$ 50,000
EPA/Water Quality Bureau	13,000
Flathead National Forest	130,000
Department of State Lands	5,000
Renewable Resource Development Grant	25,000
	$223,000

Other Cooperators

Department of Fish, Wildlife & Parks
Environmental Quality Council
University of Montana Biological Station/Yellow Bay
University of Montana School of Forestry

The Heart of the FBC: Water Quality Monitoring

EXECUTIVE SUMMARY

A primary goal of the Flathead Basin Commission is "to identify existing or potential water quality problem areas of the basin and to identify the parameters causing the problems."Various agencies under the auspices of the Flathead Basin Commission work together to monitor water quality. They have expanded the water quality database begun by the Flathead River Basin Environmental Impact Study.

Under the "Master Plan for Monitoring Water Quality in the Flathead River Basin,"researchers regularly collect data to establish "baseline-"water quality conditions, to detect trends in water quality at selected sites, to detect and document sources and causes of water pollution, to measure the integrity of select biological communities by monitoring the habitat and populations of indicator species (such as *Mysis* shrimp, westslope cutthroat trout, and bull trout), and to develop predictive relationships between key hydrological, chemical, physical, and biological variables.

This section of the *Biennial Report* is a progress report pertaining to the overall objective of monitoring water quality in the Flathead River Basin. The researchers involved in this monitoring process have not attempted to interpret thoroughly all the data in the water quality monitoring database. Rather, they have identified and analyzed key findings. Some of their conclusions and recommendations are listed below.

CONCLUSIONS

- Flathead River Basin waters remain very clean. They are highly suitable for a variety of purposes such as domestic use, irrigation, recreation, and the maintenance of trout fisheries.
- The naturally low productivity of aquatic plants and animals in the Flathead River drainage is a result of the basin's high quality waters. Increases in productivity may indicate declines in water quality.
- Researchers believe the nutrient reduction programs are working. However, the nutrient reduction programs have not been in place long enough for the effects to be seen.
- The relationships between land use activities, including forest practices, and possible increases in water and/or sediment yield require additional data and rigorous statistical analyses before they can be verified or refuted. Data from Coal Creek on the North Fork of the Flathead River suggest forest practices are increasing the load of fine sediments there; however, data from other sites suggest that the observed sediment loads are within the range of natural variation.
- The food webs in Flathead Lake and other lakes in the basin have changed dramatically since the introduction of the opossum shrimp, *Mysis*. In Flathead Lake the kokanee salmon fishery and the critical zooplankton population needed as forage for fish have declined precipitously. The ramifications of the presence of *Mysis* will continue for many years.
- The average annual primary production of phytoplankton in Flathead Lake has increased significantly since 1977, suggesting that water quality is progressively deteriorating. However, this trend may be related more to changes in the food web than to changes in nutrient pollution. Additional monitoring, data collection, and analyses are needed.
- Tributaries to the Flathead and Swan lake and river systems support what is probably the largest migratory population of bull trout in the world. The system also supports one of the most important, genetically pure, westslope cutthroat populations. Populations of these species appear relatively stable. These fish are valuable, unique, and a vital part of the ecological system.
- The quality of fish habitats in some portions of the Flathead Basin has been reduced moderately.
- Biologists planted several million kokanee salmon in the lake each year from 1987 through 1990 to test the possibility of recovering the population. In addition, they are trying approaches to mitigate the effects of the operations of both Kerr and Hungry Horse dams on the Flathead River system fisheries.

RECOMMENDATIONS

- The agencies identified in the "Master Plan for Monitoring Water Quality in the Flathead River Basin"must continue to cooperate with the Flathead Basin Commission in the monitoring of water quality variables and other activities.
- The Montana Department of State Lands, the Montana Department of Fish, Wildlife and Parks, the Water Quality Bureau of the Montana Department of Health and Environmental Sciences, and the United States Forest Service plan to continue monitoring and collecting baseline water quality data.
- Water quality monitoring of Flathead Lake and its tributaries should be continued and expanded. However, the costs of obtaining the routinely collected data have increased. For example, the Flathead Lake Biological Station will need additional funding just to continue to meet the objectives for Flathead Lake as specified in the "Master Plan for Monitoring Water Quality in the Flathead River Basin."
- Researchers must monitor key fisheries variables at important sites to evaluate the basin-wide goal of protecting aquatic resources. The Montana Department of Fish, Wildlife and Parks will require funds to continue the fisheries monitoring program at its present level.
- The "Master Plan for Monitoring Water Quality in the Flathead River Basin"was designed to be interactive and subject to adjustment upon periodic evaluation. Biologists recommend continued monitoring of many priority sites, changing priority on some sites, adding some new sites, and dropping some sites from the program.
- The individuals from the agencies which cooperate to monitor water quality recommend that all land managers apply, or continue to apply, Best Management Practices in the development of their lands.
- The members of the water quality monitoring committee feel that their efforts are critical to the preservation of the basin's relatively pristine aquatic environment. They encourage the participation of other public and private agencies and organizations in their efforts to protect the Flathead River Basin's fresh-water ecosystem by monitoring changes in its water quality.

BACKGROUND

WHY MONITOR WATER QUALITY?

What do people think of when they picture a land of pristine waters? Do they see themselves walking along cold, clear streams? Canoeing on open lakes? Battling fish they have hooked? These images reflect various aspects of relatively pure water. How would someone know if water quality in these settings had declined? The stream might be murky, the lake might be choked with vegetation, or an angler might not be able to entice a fish with a lure.

These examples involve aspects of water quality in the "big picture." However scientists measure water quality using specialized techniques and sensitive indicators. They monitor the amount of various chemical substances dissolved and suspended in the water. They also check such things as the condition of stream bottoms and lake shores, the status of fish populations, and the clarity of water.

From 1979 through 1983, researchers for the Flathead River Basin Environmental Impact Study gathered and analyzed data related to various aspects of water quality. These data set the baselines for measuring changes in water quality. The researchers also explored the environmental relationships in the Flathead River Basin ecosystem and identified ways to conserve the basin's human and natural values.

The Flathead River Basin Environmental Impact Study concluded that waters of the basin were generally very pure. However, the study documented a trend of declining water quality. Natural and man-made pollution in Montana and British Columbia threaten the generally pristine nature of the basin's water and aquatic life.

No one wants the waters of the Flathead Basin degraded beyond acceptable water quality standards. People want to preserve the Flathead Basin's relatively pristine aquatic environment. The final report of the Flathead River Basin Environmental Impact Study noted that, "the public would be willing to pay an estimated $97 million annually to protect water quality values—" To protect water quality values, people must know how and why water quality has changed.

One of the Flathead Basin Commission's goals is "to identify existing or potential water quality problem areas of the basin and to identify the parameters causing the problems." Various agencies under the auspices of the Flathead Basin Commission work together to monitor water quality. (See Table 1.) They have expanded the interagency water quality database begun by the Flathead River Basin Environmental Impact Study.

In 1986 the Commission adopted a "Master Plan for Monitoring Water Quality in the Flathead River Basin." Under this Plan, researchers regularly collect data. The Plan's objectives are:

1. To establish "baseline" water quality conditions.

2. To detect trends in water quality at selected sites.

3. To detect and document sources and causes of water pollution.

4. To measure the integrity of select biological communities by monitoring the habitat and populations of indicator species (such as *Mysis* shrimp, westslope cutthroat trout, and bull trout).

5. To develop predictive relationships between key hydrological, chemical, physical, and biological variables.

This section of the Flathead Basin Commission's *Biennial Report* describes the cooperating agencies' progress related to the monitoring activities specified under the "Master Plan for Monitoring Water Quality." The researchers involved with this monitoring process have not attempted to interpret thoroughly all the data in the database. Rather, they have identified and interpreted key findings.

Table 1: Resource management agencies involved in the collection of data under the "Master Plan for Monitoring Water Quality in the Flathead River Basin."

Montana Department of Fish, Wildlife and Parks	Fisheries inventories[1] Sampling and analysis of *Mysis* Shrimp and Zooplankton[2]
United States Forest Service	Stream water quality
Montana Department of State Lands	Stream water quality[3]
United States Geological Survey	Hydrological measures
Montana Department of Health and Environmental Sciences, Water Quality Bureau	Flathead Lake water quality[4]
Confederated Salish and Kootenai Tribes	Flathead Lake water quality[4]
Montana Power Company	Flathead Lake water quality[4]
Flathead County	Flathead Lake water quality[4]
Lake County	Flathead Lake water quality[4]

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[1] The U.S. Forest Service participated in and paid for a portion of the monitoring done by the Montana Department of Fish, Widlife and Parks.

[2] The Department of Fish, Wildlife and Parks provided funding to the Flathead Lake Biological Station (University of Montana) for the sampling and analysis of *Mysis* shrimp and zooplankton.

[3] Plum Creek Timber, Inc. paid for analysis of water quality samples collected by the Montana Department of State Lands on Lazy Creek in the Swift Creek drainage.

[4] Contracted to Flathead Lake Biological Station (University of Montana).

UPPER FLATHEAD RIVER BASIN

Various man-made boundaries cross the drainage which constitutes the upper Flathead River Basin. This part of the basin stretches from the river's headwaters in the southeastern corner of British Columbia to Kerr Dam at the outlet of Flathead Lake. The upper Flathead River receives water from an area of nearly six million acres. (See Figure 1.)

HOW DOES THE WATER CYCLE WORK?

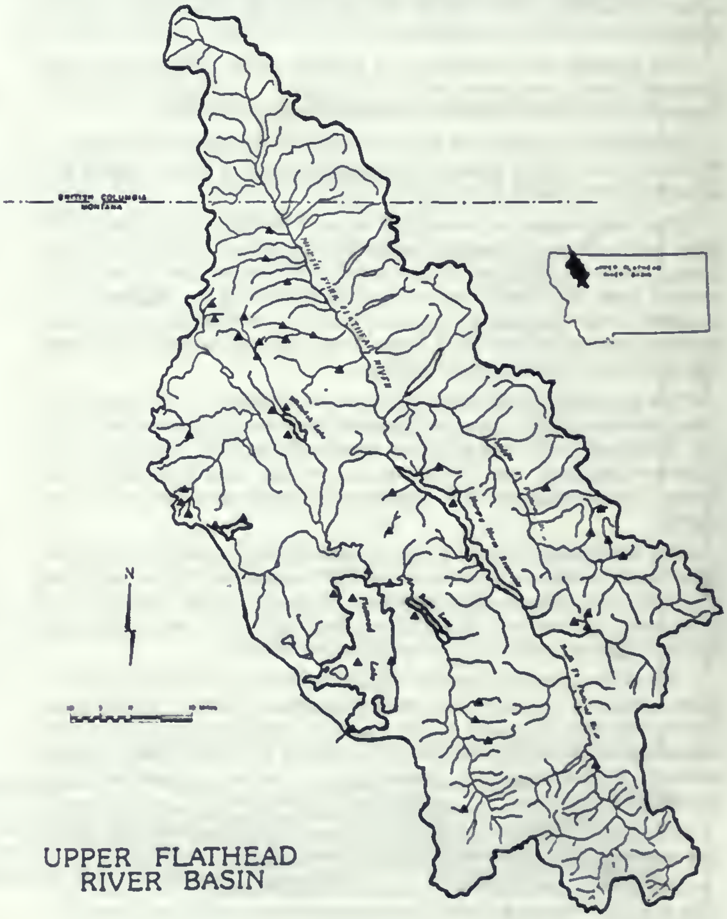
Most water is retained in the Flathead River Basin system for only a short period of time as part of the water cycle. In a simple example, this process might begin in the Pacific Ocean. When moisture evaporates from the ocean, it enters the atmosphere. If that air mass moves inland, it may hold its moisture until reaching a barrier such as the Swan Mountain Range. Uplifting over the mountains then results in additional cooling of the air mass, and the water may condense forming a cloud. Additionally, such uplifting may cause the cloud to release its moisture as rain or snow. The highest mountains may receive 70 inches or more of precipitation annually, whereas the valleys may receive only 15 to 20 inches annually. After the precipitation reaches the mountainside, some of it will runoff, some of it will evaporate, some of it will enter vegetation, and the remainder will percolate through the soil into the groundwater. Most of the groundwater will eventually emerge as a spring or enter directly into a creek or lake.

Gravity moves water downhill. The runoff water combines to make a creek. That creek will merge with other creeks to form a stream and eventually a river. Ponds or lakes may occur at any stage along the way.

Water may remain in a lake for varying periods of time. In deep lakes, the water stratifies during the summer. In the upper layer it is warmed by the sun. In the lower layer, the water remains cool and isolated. Cool water is more dense than warm water, and the water in the lower layer will not mix with the water in the upper layer until autumn, when both layers are the same temperature. A river entering a lake will seek its own level of corresponding temperature and density.

Once water reaches Flathead Lake, it will remain there on average less than three years. After traveling through the lake it will be discharged into the lower Flathead River. During that time, most of the suspended sediments will settle out of the water and onto the lakebed. Therefore, the water leaving Flathead Lake at Polson will be clearer than when it entered. The water in the Flathead River will join the Clark Fork River, then the Pend Oreille River, and finally the Columbia River. In the end, the water that entered the Flathead River Basin as precipitation will drain from the Columbia River into the Pacific Ocean, and the water cycle will begin again.

Figure 1: Upper Flathead River Basin Showing Water Quality Monitoring Stations



FACTORS INFLUENCING WATER QUALITY IN THE FLATHEAD RIVER BASIN

Fresh water ecology is the study of animals and plants in relation to their aquatic environment. Lakes and streams in the Flathead Basin support many biological species, and this diversity reflects the generally pristine condition of the basin's waters. A few of these species exist nowhere else in the world.

While the aquatic species of the basin are notably unique and diverse, individual populations are not normally abundant. The generally sterile nature of the basin's waters and the relatively short growing season limit population growth. Surface waters of the Flathead Basin contain relatively few plant growth nutrients (such as nitrates and phosphates). This reflects the underlying geology of the area. The relative shortage of such nutrients naturally limits the production of algae and other plants. In turn, the relative shortage of plants limits the populations of fish and other aquatic animals that feed on them.

Most of the streams and lakes in the basin, including Flathead Lake, seem clear and clean because of the relative shortage of nutrients. Without large amounts of nutrients, these waters cannot support the luxuriant growths of algae and bacteria that characterize richer or polluted waters.

In the Flathead Basin, nutrient supply delicately balances the diversity and abundance of living organisms. Even small additions of polluting nutrients may result in nuisance "blooms"(population explosions) of aquatic plants. In addition, such nutrients might encourage the proliferation of undesirable fish species. The native species of aquatic animals have adapted to low levels of plant growth and no single species can outcompete the others for the available forage. Over the millennia this has allowed an exceptionally large number of species, none of them very abundant, to coexist. For example, the Flathead River Basin contains almost one-fourth of the known North American stonefly species. Anything that disrupts this delicate balance is a threat to the water quality of the basin. This includes the introduction of non-native species.

The Flathead Basin's unique fishery is one component and product of the area's high water quality. More than 20 native and introduced fish species reside in streams and lakes of the Flathead Drainage. Montana's Department of Fish, Wildlife and Parks considers bull trout and cutthroat trout "species of special concern." This designation recognizes the limited range of the trout and their sensitivity to habitat degradation, to angler harvesting, and to potential hybridization with non-native fishes.

These fish mature in large lakes, but then migrate upstream into the rivers and tributary creeks to spawn. The eggs hatch and after a period of time the juvenile fish migrate back downstream into the lakes to grow and complete the cycle. This migratory pattern is significant because the fish are sensitive to environmental changes throughout the entire aquatic system. Since they are sensitive to changes in their habitat, they are excellent indicator species for long-term monitoring of habitat integrity.

CAUSES OF DECREASED WATER QUALITY

Natural and human-caused events can lead to the deterioration of water quality. For example, water clarity "naturally"decreases and suspended sediment and nutrient loads "naturally"increase during spring runoff, even in headwaters in wilderness areas. Also, *Giardia lamblia*, a protozoan that can infect humans, may be present in waters "naturally-"because their cysts are spread by wild animals.

Poor forestry and agricultural practices, dams and other stream regulation, resource extraction, and urbanization are common sources of human-related water pollution. Common causes of water pollution include excess nutrients, sediment, changes in water temperature, and altered stream flows or lake levels.

HOW IS WATER QUALITY MONITORED?

Water chemistry, flow, turbidity, sediments, water temperature, and other factors affect water quality. Since fish live in water, the same variables strongly affect them.

Researchers measure fish habitat quality by looking at the size and amount of fine materials in streambeds and the emergence success of fry from gravels. They analyze fish populations by measuring the number and size of fish and by counting redds (nests built by spawning fish). They also monitor zooplankton (tiny shrimp eaten by fish) to determine their effect on fish populations.

The 1986 *Master Plan for Monitoring Surface Water Quality in the Flathead Basin lists* the array of over 50 monitoring sites discussed in this report. Researchers monitor water quality variables at these sites. The sites were selected based on a range of issues and concerns. They cover a variety of Flathead Basin water bodies, including Flathead Lake. The sites also represent major land ownerships in the basin, including the Flathead National Forest and the Stillwater State Forest. (See Figure 1.)

Researchers use standard techniques for the collection and analysis of hydrological, chemical, and biological data, and to assure precise and reliable data. Individuals from four agencies wrote the reports used as a basis for this Chapter. These reports are:

(1) "Monitoring Fisheries Habitat and Fish Populations in the Flathead Basin"(By Montana Department of Fish, Wildlife and Parks).

(2) "Surface Water Quality of the Stillwater State Forest"(By Gary Frank and Bill Schultz, Forestry Division, Montana Department of State Lands).

(3) "Flathead National Forest Report on Water Quality Monitoring to Flathead Basin Commission"(By Wally Page, Hydrologist, Flathead National Forest).

(4) "Monitoring Water Quality in Flathead Lake, Montana 1990 Progress Report"(By Jack A. Stanford, Bonnie K. Ellis and Craig N. Spencer, Flathead Lake Biological Station, University of Montana).

Individuals can obtain copies of these reports from the Flathead Basin Commission's Public Information Officer (Mark Holston, 723 Fifth Avenue East, Kalispell, Montana 59901, 406-752-0081).

IMPORTANT FINDINGS

WATER QUALITY IN HEADWATER STREAMS

Water Flow

The amount of precipitation in the Flathead River Basin varies both annually and seasonally. When annual precipitation is lower than normal, less water flows into creeks and into the groundwater, so streams discharge less water into Flathead River and Flathead Lake. Figure 2 shows the average annual flow for the 51 year period from 1939 through 1989 for the North Fork of the Flathead River. (Flow data for the North Fork are representative of data obtained from other streams and rivers.) Over the analysis period (1986-1989), the Flathead River flows have been below normal.

Snowmelt in the mountains provides most of the water for the Flathead River Basin. The greatest variations in water flow occur when the snow is melting, especially when coupled with periods of spring rain and alternating warm and cool weather. Figure 3 shows the daily flows in 1989 for two representative waterways — the North Fork of the Flathead River and Coal Creek. The months of May and June account for about 60 percent of the annual flow volume. Most streams show at least 50-fold variations between minimum and maximum flows within a year. In summer and fall, rains may or may not increase the flow of water. However, flow can respond dramatically after prolonged heavy rain, as occurred in mid-November of 1989.

In addition to natural events, dams regulate stream flows and lake levels. That regulation affects water temperatures and the organisms growing in the water as well as the amount of water available. The 1988 *Biennial Report* of the Flathead Basin Commission detailed some consequences related to the operation of Kerr and Hungry Horse dams and the effects of such water regulation on water quality.

Turbidity and Sediments

Water dissolves, dilutes, transports, and deposits substances found on land, in air, and in water. Surface water from rain or snowmelt picks up grit, dirt, and debris on its way to join creeks. Water flowing in a stream may also churn up the stream-bottom sediments and erode stream banks. Most of this erosion is natural — a function of topography, geology, plant cover, and weather. Human activities trigger other erosion. For example, road building, poor logging or agricultural practices, resource extraction, and other land development can increase surface runoff and the movement of sediments. The larger the stream discharge, the more energy there is to erode and transport sediments and the higher the concentration of suspended sediments.

Sediments in streams are mostly inorganic (sand, silt, and clay), but may also include tiny bits and pieces of plant and animal remains (organic matter). Suspended sediments are materials carried by the water. Streams with more sediment available for transport will normally have more suspended sediment in their discharge (a supply-based concept). Another relationship between sediment and discharge is that in a year when water flow is low, sediment discharge generally is also low (an energy-based concept). Changes in the sediment-to-discharge relationship may indicate changes in water quality.

Figure 2: North Fork of Flathead River
Average Annual Flow 1939-1989

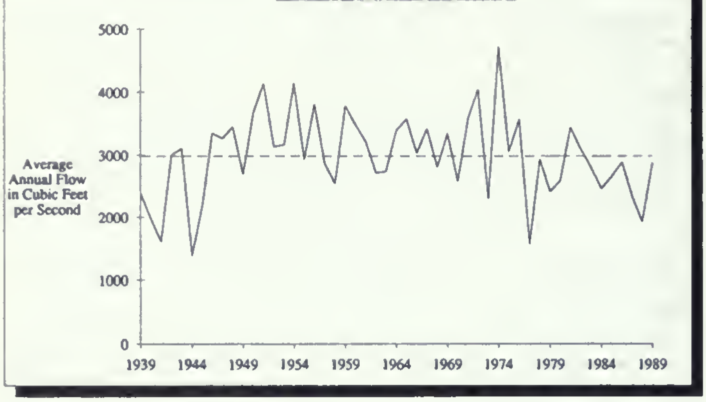


Figure 4: Total Suspended Sediment
Annual Yield
Hungry Horse Ranger District

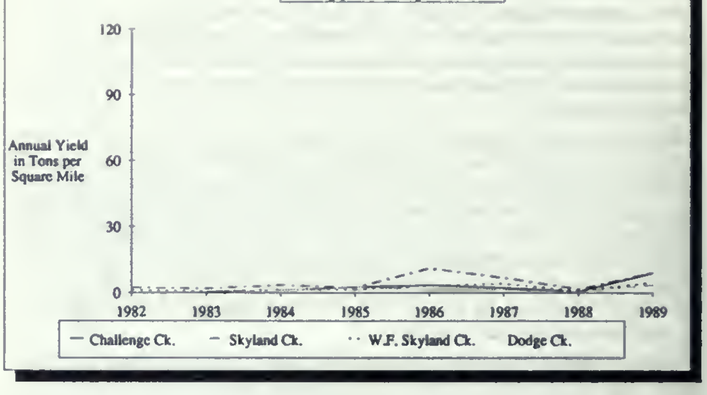


Figure 3: North Fork of Flathead River and Coal Creek
1989 Daily Flows

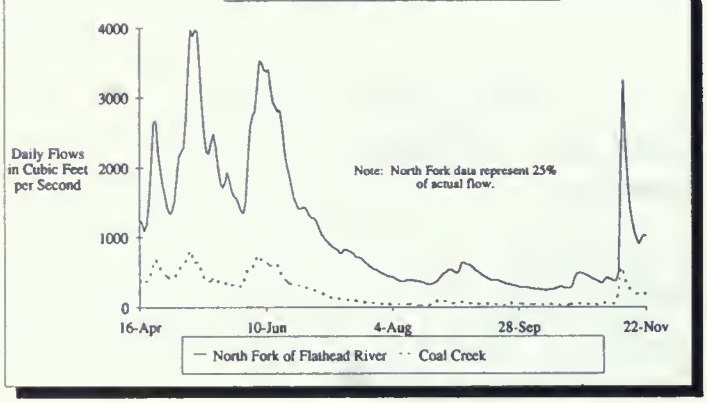
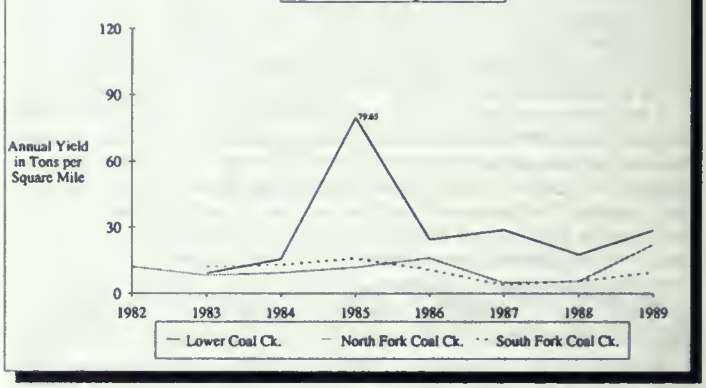


Figure 5: Total Suspended Sediment
Annual Yield
Glacier View Ranger District



Turbidity is haziness or cloudiness in water caused by suspended sediments. The Montana Surface Water Quality Standards permit no turbidity increases above "naturally occurring" levels in large portions of the upper Flathead River Basin, including Flathead Lake. Average turbidity levels for all monitored streams ranged between less than 1 and 51 Nephelometric Turbidity Units (NTU). (A turbidity rating of 8 to 10 NTU means that there is visible muddiness — that the water is slightly milky.) Most turbidity increases do not last long. They often occur during the first snowmelt in the spring and after high intensity rainstorms.

Krause Creek (just east of Kalispell) is an anomaly in the Flathead River Basin drainage. It has naturally high turbidity levels (of 53 NTU in 1986 and 50 NTU in 1987). At times, Krause Creek looks like a vanilla milkshake. Glacial till (unstratified silt strewn with stones produced by the grinding action of a great ice sheet) in the Krause Creek drainage is eroding naturally. This causes debris avalanches. Finely ground materials from this process enter upper stream reaches and increase the creek's turbidity.

Along with high turbidity levels, Krause Creek has the highest average measured sediment concentration (287 milligrams per liter). In contrast, the streams in the Tally Lake Ranger District flow off areas with gentler slopes and have some of the lowest average sediment concentrations (generally less than 4 milligrams per liter).

Hydrologists use trends and deviations from normal suspended sediment concentrations and loads to measure and detect changes in water quality. Figures 4 and 5 display suspended sediment yields for several creeks. For the streams charted, annual suspended sediment yields ranged from 0.44 tons per square mile (on Challenge Creek in 1982) to 79.65 tons per square mile (on Lower Coal Creek in 1985). These figures also demonstrate higher than average suspended sediment yields for 1989. The near average streamflows (compared to the drier conditions in earlier years) probably caused the higher yields.

Swift Creek is a major tributary of Whitefish Lake. The average annual yield of suspended sediments over the period from 1976 through 1989 in lower Swift Creek (as measured at Crain's Ranch) was 126 tons per square mile. This yield was 6 to 100 times higher than average yields at some of the other sites monitored. (See Figure 6.) Annual suspended sediment yields at stations further upstream on Swift Creek indicate sedimentation rates within the range expected for similar geological areas in a natural state.

Suspended sediment concentrations and yields for lower Swift Creek are consistently 5 to 10 times greater at high flow than for upper Swift Creek (as measured at the Concrete Bridge). The annual suspended sediment yield for lower Swift Creek is 6 times greater than for upper Swift Creek, and 8 times greater than for the West Fork of Swift Creek. Other than Krause Creek, Swift Creek at Crain's Ranch is the only station to have suspended sediment concentrations periodically above 100 milligrams per liter. (This occurred in 13 of the 141 samples taken.) Approximately 80% of the suspended sediment yield in Swift Creek comes from the channel's lower eight to ten miles. Lower Swift Creek is undercutting glacial fluvial gravels and old lake deposits (clay banks). Natural erosion of these deposits along the creek's lower reaches provides a large supply of sediment and causes the high yields measured.

Mathematical analyses show that as water flow increases, the suspended sediment concentration generally increases. The exact relationship varies with different seasons, different streams, and different years. This information is important since the concentrations of suspended sediments closely correlate with the amounts of phosphate nutrients available.

Bedload consists of the transportable material at the bottom of a water channel. Bedload movement may scour stream bottoms during spring runoff or violent storms. This scouring prevents widespread accumulations of sediments in the upper reaches. In addition, when the stream redeposits the bedload, the materials fill in pools downstream.

Over the last few years, hydrologists regularly have measured the movement of bedloads. They want to discover how much of the total sediment load in streams consists of bedload. They also want to tie their bedload data to the information biologists have been gathering related to fish habitats on stream bottoms.

On an annual load basis in most streams, bedload makes up less than 10% of the total sediment load. Streams hold the remaining 90% or more as suspended load. An important consideration is that bedload moves for just a few days each year — when stream velocities are highest (that is, it moves in surges during high flows). The stream then stores the bedload on the stream bottom until the next large event (such as a period of heavy spring runoff).

Streams with large accumulations of stored sediment or unstable banks are more apt to have significant bedload movements than other streams. If researchers identified a trend of increasing bedload movement, it would imply a decrease in water quality. Fish eggs, for example, might not be able to survive such movements, and the whole aquatic ecosystem might suffer. So far, researchers have not identified any trends indicating increasing bedload movement.

Water Chemistry

Much of the surface water flowing in the Flathead River Basin has spent some time underground. The often-times different chemical composition of ground water influences the quality of surface water. Bedrock influences water quality because the groundwater dissolves the minerals of the bedrock. Some waters in the Flathead River Basin have naturally moderate amounts of dissolved constituents because they flow through limestone. Those waters flowing through quartzites and mudstones have naturally low amounts of dissolved constituents.

Flathead River Basin water ranges from soft (containing few dissolved minerals) to moderately hard. Most of the water chemistry data show that water in the basin is suitable for all designated uses (such as for cold-water aquatic life, public water supplies, recreation, irrigation, and industrial uses). However, there is wide seasonal fluctuation of some constituents. For example, in spring large quantities of melted snow enter streams. This snowmelt dilutes calcium bicarbonate and other dissolved constituents in the surface waters. Such snowmelt has not had much time to dissolve minerals from the soils before entering the stream. Therefore it also lowers the specific conductance, hardness, and alkalinity (buffering capacity for neutralizing acids) of the surface water.

Nutrients, metals, and pesticides may be attached to the smallest sediment particles in streams. The more nutrients dissolved in a body of water, the more plant and animal life the water can usually support. Contrary as it may seem, an over-abundance of plant and animal life signifies a decrease in water quality. Highly productive waters contain large crops of plants, large amounts of decaying matter, large numbers of bacteria, and low dissolved oxygen. Water clarity decreases, noxious plants may flourish, and "rough"fish (those tolerant of warmer waters and less oxygen) may predominate. Also, the water may taste and smell bad.

Researchers focus their attention on the amounts of phosphates and nitrates (types of nutrients) in the Flathead River Basin. This is because phosphates and nitrates usually limit the growth of plants. When more phosphates or nitrates enter an aquatic ecosystem (everything else remaining constant), more plant growth usually occurs. Increased plant growth decreases water clarity, and water clarity is a sign of water quality. Therefore, increases in phosphates and nitrates may decrease water quality.

Researchers believe the primary sources of phosphate in the drainages are decomposed organic matter (sewage), phosphorus compounds stored on sediments, and phosphorus that falls from the air combined with precipitation and dust. Concentrations of phosphate increase as water flow increases. This indicates a surface source of phosphate rather than a groundwater source (since groundwater flows remain fairly uniform at peak stream flows).

Phosphorus concentrations generally show significant positive correlation with water discharge and suspended sediments. That is, if there is more water flowing, suspended sediment concentrations will increase; and as the concentrations of suspended sediment increase, so will the concentrations of phosphorus (which is attached to the sediment particles).

Chicken Creek is a baseline station — it measures water quality from a creek in a drainage undisturbed by humans. Portions of the Swift Creek drainage, on the other hand, have been logged. Land managers have harvested considerable amounts of timber and built many roads in the drainages of both the West and East Forks of Swift Creek. For the period from 1976 through 1989, Chicken Creek's average annual *suspended sediment* yield in tons per square mile was only about one-third of the suspended sediment yields at the West Fork of Swift Creek and the East Fork of Swift Creek. (See Figure 6.) However, Chicken Creek's average annual *phosphorus* yield in pounds per square mile over the period of record (from 1982 through 1989) was higher than the average annual phosphorus yields of the West and East Forks of Swift Creek. (See Figure 7.) With evidence such as this, hydrologists have not found a significant statistical relationship between phosphorus concentration and forest development in the Swift Creek drainage of the Stillwater State Forest.

Researchers often classify lakes on a continuum from oligotrophic to eutrophic. Oligotrophic lakes are usually deep, have a good oxygen supply, cold water, and low plant and animal productivity. Eutrophic lakes have abundant nutrients, a decreased oxygen supply, warmer water, and high plant and animal productivity.

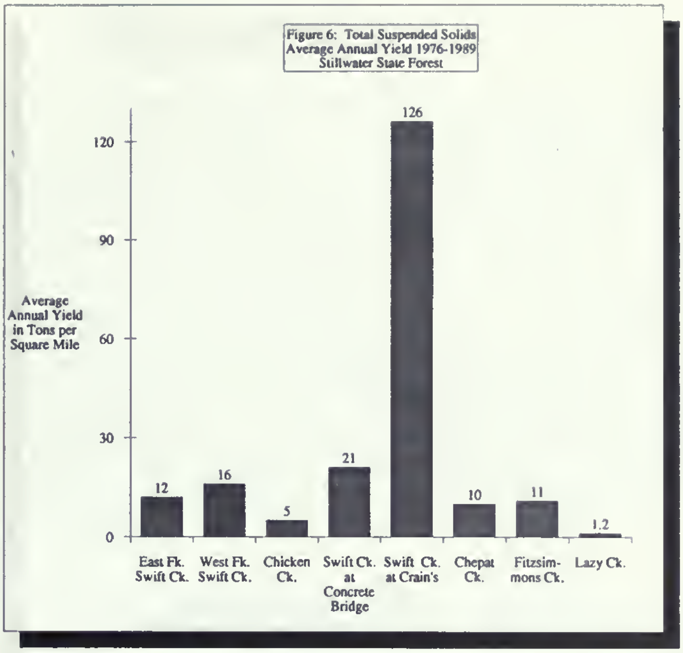


Figure 6: Total Suspended Solids
Average Annual Yield 1976-1989
Stillwater State Forest

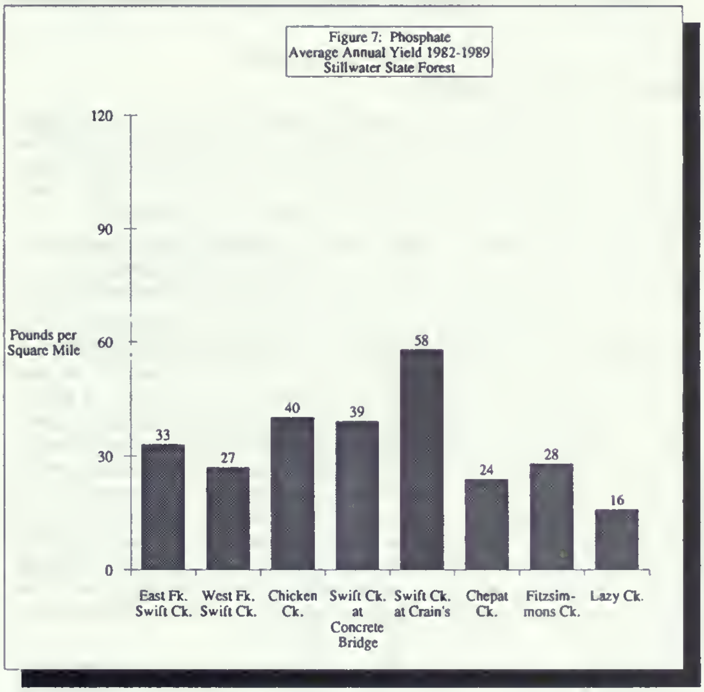


Figure 7: Phosphate
Average Annual Yield 1982-1989
Stillwater State Forest

Whitefish Lake is oligomesotrophic. That means that it is on the threshold of change. Researchers have concluded that adding additional nutrients to the lake will further stimulate algal productivity.

Swift Creek supplies water to Whitefish Lake. Over the period from 1982 through 1989, lower Swift Creek (as measured at Crain's Ranch) had an average annual yield of 58 pounds of phosphorus per square mile. (See Figure 7.) This annual yield was over three-and-a-half times higher than the average annual yield measured in the same vicinity at Lazy Creek.

The data for lower Swift Creek indicate that soluble reactive phosphate makes up only about 10% of the total annual phosphorus yield. (Soluble reactive phosphate is a form of phosphorus that is available for plant growth.) Figure 8 compares the relationship between phosphorus concentration and suspended sediments at the Flathead River and at two sites on Swift Creek. These data show that when suspended sediment levels are high, total phosphorus concentrations are high.

Generally, nitrate concentrations do not increase or decrease in a consistent manner when either discharge or suspended sediment yields increase or decrease. Researchers believe that this lack of correlation may be due to its high solubility. The maximum nitrate concentration recorded was 0.21 milligrams per liter. Most nitrate concentrations were less than one-tenth of that concentration.

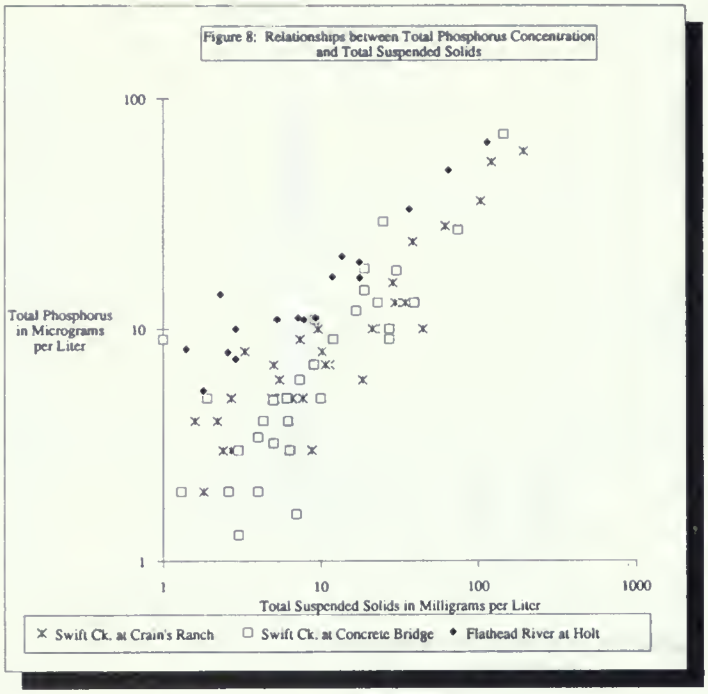


Figure 8: Relationships between Total Phosphorus Concentration and Total Suspended Solids

WATER QUALITY IN FLATHEAD LAKE AND ITS TRIBUTARIES

Data added to the water quality database since the Flathead Basin Commission's 1988 *Biennial Report* have not substantially changed the long-term averages and ranges for most sites monitored. Indeed, based on water chemistry data over the period from 1977 through 1989, water quality remains high in Flathead Lake and most of its tributaries.

Ashley Creek continues to be the notable exception. This creek drains water from the Kalispell Sewage Treatment Plant into Flathead Lake. It still contributes substantial loads of human-caused nutrients to the lake.

From 1977 through 1989, Ashley Creek annually contributed 12 to 18 percent of the phosphate that reached the lake. (See Figure 9.) Researchers cannot say how much of the load was from human-related sources. However, human-related sources must have been substantial. For example, over the 13 year period, water from Ashley Creek contained an average of 426.6 micrograms of soluble reactive phosphate per liter of water. If Ashley Creek were in a pristine condition, one would expect it to have nutrient concentrations similar to other Flathead River Basin streams. As a comparison, water from the Swan River contained an average of only 1.2 micrograms of soluble reactive phosphate per liter. Ashley Creek contained 355 times more phosphate per liter than the Swan River. This significant difference implies that a substantial amount of Ashley Creek's nutrient concentration came from human-related sources (for example, the Kalispell sewage treatment plant).

The air above Flathead Lake also continued to contribute substantial loads of nutrients into the lake. Most of these nutrients are apparently derived from human activities. Rain, snow, and dust annually dropped 23 to 38 percent of Flathead Lake's total phosphorus load directly onto the surface of the lake. Bulk precipitation samples taken immediately after periods of air stagnation routinely contained phosphorous concentrations about ten times higher than samples taken after periods of thorough air circulation. Wood smoke often polluted the air in the Flathead River Basin. Particulates from wood smoke seemed to contribute substantially to the higher phosphorus load measured in the bulk precipitation samples during air stagnation.

Concentrations of nitrogen and phosphorus have been comparatively high in Stoner Creek, also. In the past, researchers have assumed the high nutrient concentrations in Stoner Creek came from the leaching of septic tank drain fields around the town of Lakeside. Lakeside has recently completed a new sewage system, and this may reduce the nutrient loads carried by Stoner Creek. However, at the present time there is little evidence of that in the database.

Researchers recognize the need to examine thoroughly nutrient data in terms of load rather than concentration. This task requires accurate streamflow data for all tributaries that contribute water to the lake. The U.S. Geological Survey gauges the discharge of Flathead Lake's major tributaries. However, no one has maintained long-term records on discharge for Ashley Creek and shoreline tributaries (such as Stoner Creek). Without time-series discharge data, researchers find it difficult to allocate nutrient loads.

During the last two years, researchers measured discharges in Ashley Creek and Stoner Creek. They wanted to develop a relationship between the creeks' flow patterns and the flow patterns of those sites where long-term records already existed. These records will eventually allow researchers to more accurately estimate the loads of soluble materials being discharged from Ashley Creek and Stoner Creek into Flathead Lake.

Researchers have found no discernible long-term patterns in the chemical environment of Flathead Lake. However, seasonal dynamics occur. For example, nutrient loads increase dramatically in association with spring runoff. (See Figure 10.) During late summer, aquatic plants, particularly phytoplankton, in the water column assimilate nitrate in surface waters. Kerr Dam also removes water off the surface of Flathead Lake. These events deplete nitrate from the upper layers of Flathead Lake.

Chlorophyll concentrations and rates of phytoplankton growth routinely increase during the spring and early summer. This occurs because light, nutrients and the temperature regime favor increased production. Indeed, analysis of the database shows a relatively good relationship between primary production and chlorophyll concentration.

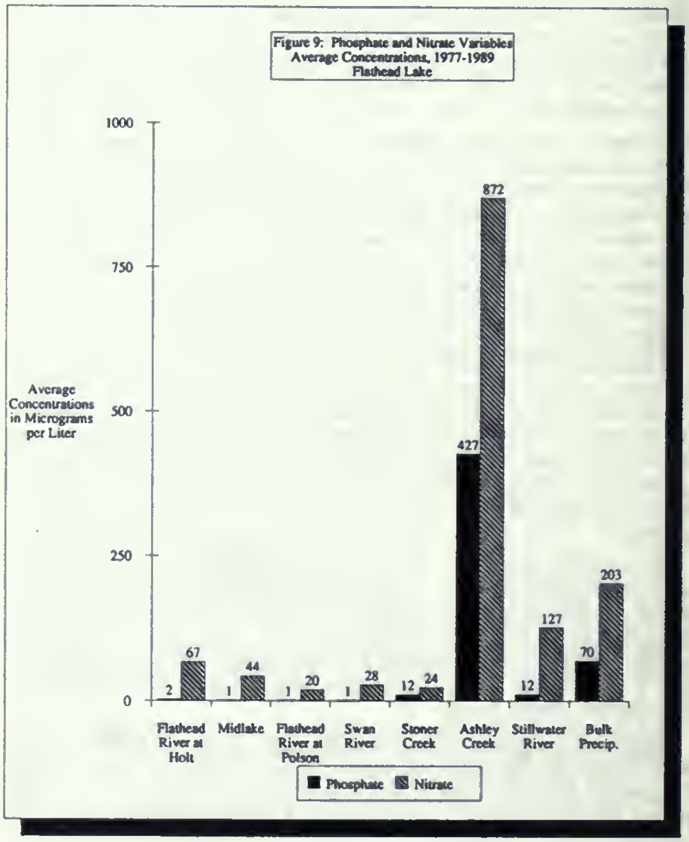


Figure 9: Phosphate and Nitrate Variables Average Concentrations, 1977-1989 Flathead Lake

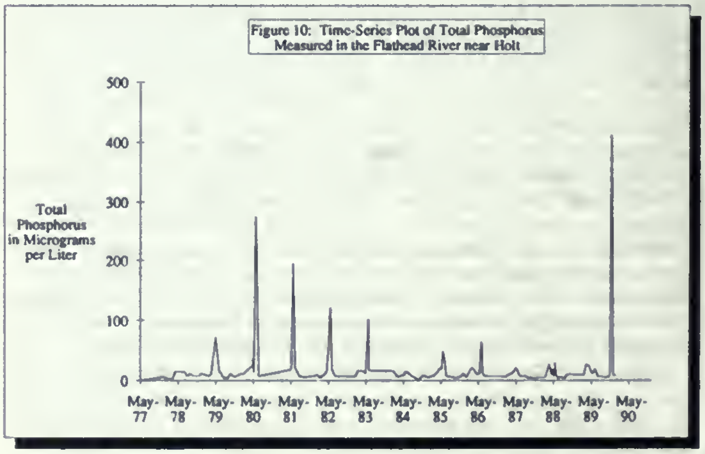


Figure 10: Time-Series Plot of Total Phosphorus Measured in the Flathead River near Holt

Researchers at the Flathead Lake Biological Station also have observed a long-term increase in primary production (that is, the propensity of the lake to grow plants) within the water column of Flathead Lake. (See Figure 11.) The trend is statistically significant and suggests that algae and other microorganisms in the lake are being fertilized by excess nutrients from the drainage basin and from polluted precipitation that falls on the lake surface. However, the researchers also note that most of the data points that pull the trend line positive are associated with the long-term dynamics of *Mysis* (see Figure 12), and may therefore be related more to food web changes (discussed below) than to changes in nutrient loads. Further monitoring data and analyses are needed to determine cause and effect in these time-series primary production data.

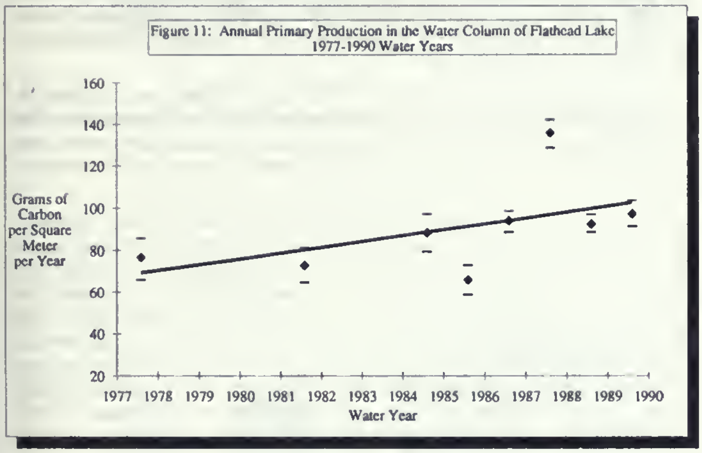


Figure 11: Annual Primary Production in the Water Column of Flathead Lake
1977-1990 Water Years

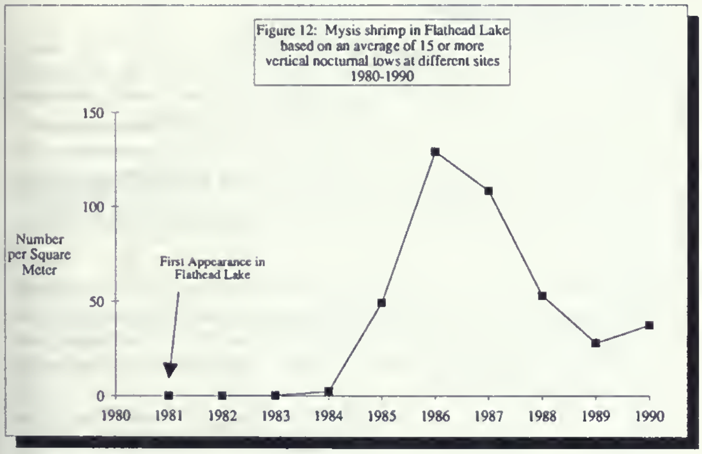


Figure 12: Mysis shrimp in Flathead Lake
based on an average of 15 or more
vertical nocturnal tows at different sites
1980-1990

MYSIS SHRIMP AND OTHER ZOOPLANKTON

Mysis relicta (opossum shrimp) first appeared in Flathead Lake in 1981. (See Figure 12.) Their presence in the lake has had little apparent effect on the chemical environment of the lake or the dynamics of the phytoplankton community.

However, the population dynamics of *Mysis* shrimp in Flathead Lake present a classical case for a newly invading predator. They have significantly affected zooplankton and other consumers in Flathead Lake. Following their initial appearance, densities of *Mysis* shrimp increased exponentially. They reached a maximum density of 129 shrimp per square meter in 1986. (See Figure 12.)

Mysis shrimp prey mainly on crustacean zooplankton (such as water fleas). As the density of *Mysis* shrimp increased, the density of zooplankton declined dramatically. (See Figure 13.) The density of *Mysis* shrimp peaked in 1986 then declined for three successive years. *Mysis* density reached a low of 28 shrimp per square meter in 1989. This decline in abundance appears to have been a density-dependent response. *Mysis* shrimp depleted the stock of their zooplankton prey and more fish ate the *Mysis* shrimp. Preliminary evidence suggests that several fish species (including lake whitefish and young lake trout) feed on *Mysis* shrimp. Consequently, the density of these fish may have increased.

Following three years of decline, the density of *Mysis* shrimp increased slightly in 1990. Researchers expect to see a compensatory response in the zooplankton community. Several water flea species (cladoceran zooplankton such as *Leptodora kindtii* and *Daphnia longiremis*) disappeared from sample collections during 1985 through 1987. They reappeared in samples collected in 1989 and 1990. Water flea densities have not recovered to pre-*Mysis* shrimp levels.

Mysis shrimp are cold-water organisms. From November through June, they prey on water fleas throughout the entire water column. *Mysis* shrimp decimate water flea populations during this time period. From July through September, Flathead Lake becomes thermally stratified, and surface waters reach temperatures of more than 15 Centigrade. *Mysis* shrimp remain in the cooler waters below the thermocline (the zone of rapid water temperature change). This creates a refuge for zooplankton above the *Mysis* shrimp. Researchers only find significant numbers of water fleas during these warm summer months.

Biologists monitored densities of juvenile and adult *Mysis* shrimp in Swan, Ashley, and Whitefish lakes from 1983 to 1990. (See Figure 14.) They found between 20 and 252 *Mysis* shrimp per square meter of lake surface. Despite relatively high *Mysis* shrimp densities, kokanee salmon have persisted in Swan and Ashley Lakes. Over the period from 1987 through 1989 in Swan Lake, biologists counted increasing numbers of kokanee redds (spawning nests) in shoreline areas of Swan Lake. In 1987 they counted 1,555 kokanee redds, in 1988 they counted 1,855, and in 1989 they counted 1,941. However, in Whitefish Lake kokanee salmon virtually disappeared after the *Mysis* shrimp became established.

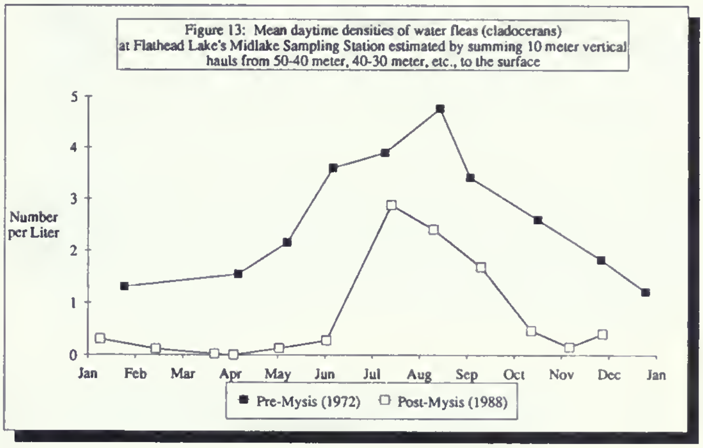


Figure 13: Mean daytime densities of water fleas (cladocerans)
at Flathead Lake's Midlake Sampling Station estimated by summing 10 meter vertical
hauls from 50-40 meter, 40-30 meter, etc., to the surface

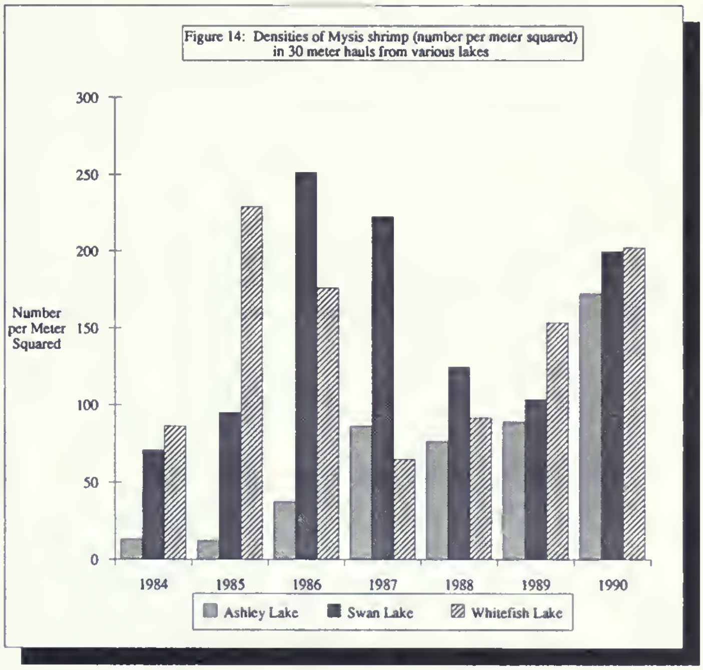


Figure 14: Densities of Mysis shrimp (number per meter squared)
in 30 meter hauls from various lakes

FISHERIES

Fish Habitat Quality

Fish lay their eggs in the gravels of streambeds. The embryos need dissolved oxygen to survive, and they obtain it from the water circulating through the gravel. Water must also circulate around the eggs to remove metabolic wastes. If the gravel contains too much sediment, the water cannot circulate effectively. Without oxygen, the fish eggs die. Also, newly hatched fish can be trapped in the sediments of a streambed and die.

Because of its effect on the nurturing of newly hatched fish, the concentration of fine materials (sediments) in stream bottoms is a key indicator of fish habitat quality. Streambed gravels containing large concentrations of materials with diameters of less than one-fourth inch can reduce the survival rate of fish eggs. Figure 15 demonstrates that as the percentage of fine materials in a streambed increases, fewer bull trout fry emerge from nests in the gravel. (The relationship between the percentage of fine materials in a streambed and the emergence success of westslope cutthroat fry is similar to that for bull trout fry.)

Biologists monitor the percentage of fine materials in the stream-bottom gravels of important streams used by spawning bull trout and cutthroat trout. Figure 16 compares the percentages of fine materials in the streambed gravels of Coal Creek and Trail Creek. Trail Creek gravels contain a relatively low percentage. Coal Creek gravels contain a relatively high percentage of fine materials. Researchers think that runoff from the Coal Creek drainage is high relative to the amount of land area. This increased runoff increases the amount of sediment in the creek. (See Figure 5.) Researchers suspect that land management practices in Coal Creek (such as timber harvest and road building) have increased runoff and sediment loads.

In the South Fork of Coal Creek, fine materials decreased significantly between 1985 and 1986. Researchers have noted no significant changes in fine materials since 1986. No major land disturbing activities have taken place in the South Fork of Coal Creek above the sampling site since biologists began collecting data in 1985. However, a large amount of material currently is deposited behind beaver dams on the South Fork of Coal Creek drainage.

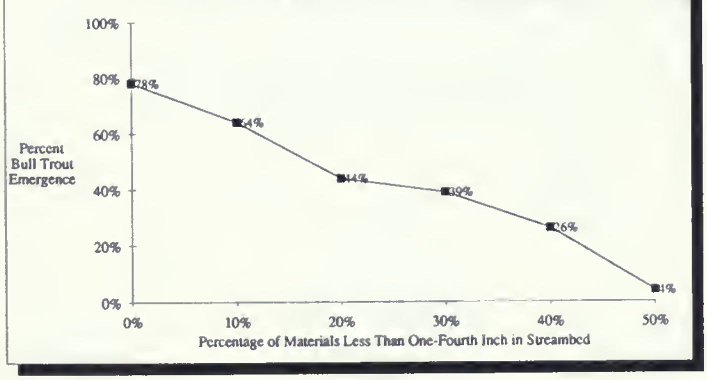


Figure 15: Bull Trout Emergence
Relationship between percentage of fine materials and emergence success of bull trout from gravels in Coal Creek, North Fork of Flathead River drainage, 1990

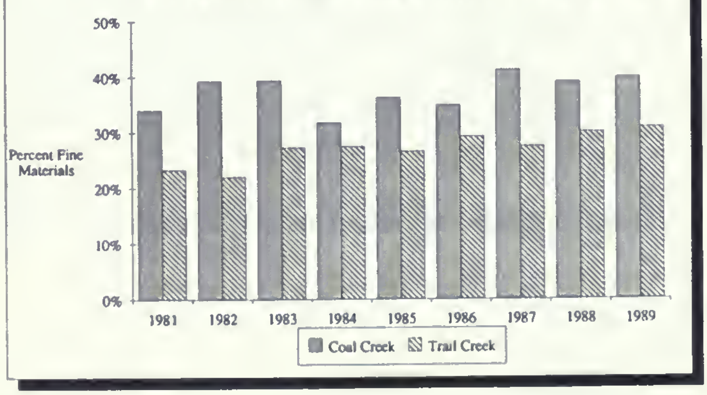


Figure 16: Streambed Composition
Percentage of materials less than one-fourth inch in gravels of Coal and Trail Creeks

In the North Fork of Coal Creek, fine materials decreased significantly between 1985 and 1986, but then they increased significantly between 1987 and 1988. Land managers are currently harvesting timber in the North Fork of Coal Creek above the sampling site. Furthermore, biologists have noted considerable natural erosion and slumping in the headwaters area (especially when compared to the upper South Fork of Coal Creek). Biologists also noted several other sources of sediment caused by forest management practices. Since then, U.S. Forest Service employees have completed efforts to help stabilize several of the identified problem areas.

Gravel beds important to spawning bull trout in Coal Creek on the North Fork of the Flathead River contained slightly greater amounts of fine sediment than did other North Fork tributaries. Researchers need to continue monitoring gravel conditions in these key bull trout creeks over a long period of time to determine trends in spawning gravel conditions relative to forest practices.

Sampling revealed few significant differences in sediment concentrations at other sites in the North, Middle, and South Fork drainages of the Flathead River. However, in 1989 concentrations of sediments increased in Lion Creek, Squeezer Creek, and Goat Creek in the Swan River drainage.

It is also important to measure the degree of embeddedness of individual stream bed rocks because that is a factor related to the rearing space for young trout. Young bull trout need to have hiding places under and between clean rocks on stream bottoms. Biologists have monitored the level of rearing space at important sites using an index known as the substrate score. A substrate score greater than 11 indicates good rearing habitat for juvenile fish. Scores of less than 9 indicate unsuitable habitat. Substrate scores at all sites from 1983 to 1989 measured above 9. However, scores for Coal Creek were barely above 9 and decreased in 1988 and 1989.

FISH POPULATIONS

Biologists monitor fish populations in streams by counting redds (spawning nests) or by electrofishing (stunning fish) in a given stream section. They sample the fish in lakes using capture nets (which entangle the gill covers of fish) and hydroacoustic (sonar) equipment.

Bull trout and cutthroat trout are particularly sensitive to environmental disturbances. When analyzing the long-term data, biologists must take the natural fluctuations of the fish populations into account. Taking this into account, trout are still excellent indicators of environmental quality.

Bull Trout

Most adult bull trout live in lakes and migrate into tributaries to spawn. Biologists find it easier to survey the spawning runs of bull trout (which occur in September) than the spawning runs of westslope cutthroat trout (which occur during spring runoff). Both types of trout have similar needs in terms of spawning gravel.

The number of bull trout redds (spawning nests) at sites in the North and Middle Fork drainages of the Flathead River is an indication of the number of adult spawners migrating from Flathead Lake. In the eight index tributaries surveyed from 1979 through 1989, biologists identified between 188 and 600 redds annually. These drainages contained over 400 redds in 1987, in 1988, and in 1989. Overall, the redd counts in the drainage indicate a relatively stable trend in the bull trout spawning population. (See Figure 17.)

Studies have shown that, on average, three bull trout construct each redd. Counts in these index tributaries represent one-quarter to one-third of all adult bull trout that participate in the spawning run. In addition, biologists have estimated that about one-half of the adult bull trout in Flathead Lake embark on a spawning run each year.

Biologists have surveyed four tributaries in the Swan River drainage since 1982. In the period from 1985 through 1989, the number of redds in these tributaries steadily increased from 109 to 371. Swan Lake supports a much larger spawning population relative to its size than does Flathead Lake.

Biologists have identified Morrison Creek in the Middle Fork drainage and Coal Creek in the North Fork drainage as two key index streams for monitoring juvenile bull trout. The population of juvenile bull trout in Morrison Creek has been relatively stable over the period of record. (See Figure 18.) However, biologists have noted higher levels of juvenile bull trout in the last four years.

The number of juvenile bull trout in Coal Creek declined in 1989 after a four-year period of relatively high numbers. Populations of juvenile bull trout in the North Fork of Coal Creek and in Big Creek were relatively stable from 1985 through 1989.

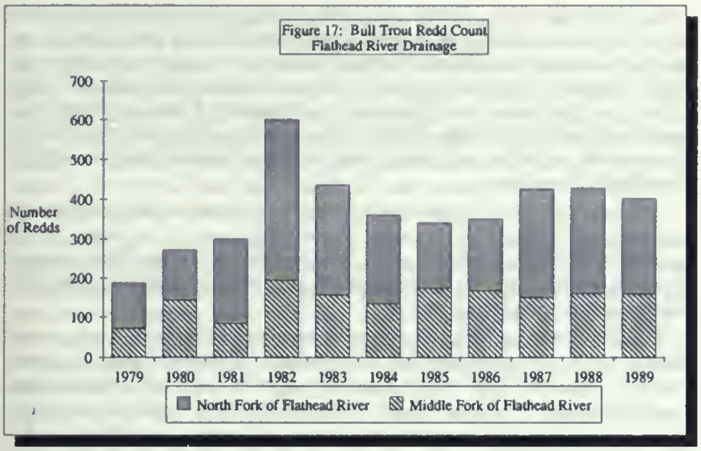


Figure 17: Bull Trout Redd Count
Flathead River Drainage

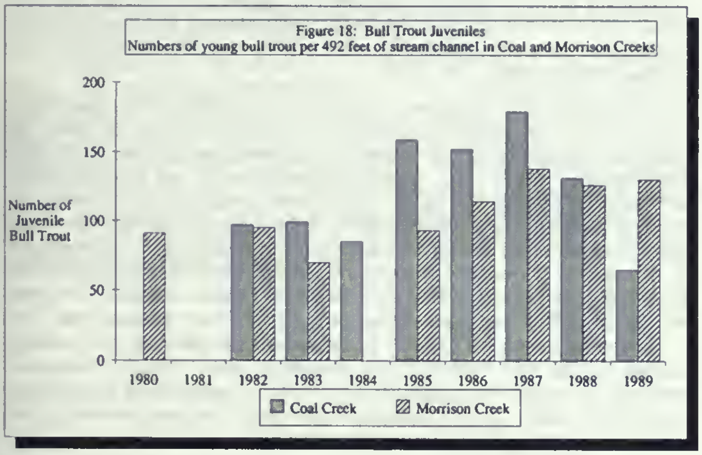


Figure 18: Bull Trout Juveniles
Numbers of young bull trout per 492 feet of stream channel in Coal and Morrison Creeks

Westslope Cutthroat Trout

Biologists have identified Red Meadow Creek in the North Fork drainage and Challenge Creek in the Middle Fork drainage as important streams for juvenile cutthroat. Overall, populations of this "species of special concern" appear relatively stable in Flathead Basin tributaries.

Biologists count the numbers of juvenile westslope cutthroat that leave Hungry Horse Creek and enter Hungry Horse Reservoir. During the period of record, they counted from 980 to 2,680 juvenile westslope cutthroat trout. Recently, the number of adult spawning westslope cutthroat trout in Hungry Horse Creek has declined. However, the number of juvenile westslope cutthroat trout leaving Hungry Horse Creek has not declined.

The number and weight of juvenile westslope cutthroat trout fluctuated in most index streams during the period of record. After analyzing these numbers and weights, biologists determined that fluctuations of 50 percent are common. Biologists in Idaho have reported similar fluctuations in trout populations in their streams.

Anglers catch westslope cutthroat trout, thus decreasing their numbers. In addition, the operation of Hungry Horse Dam affects the number of trout in the Upper South Fork of the Flathead River since some of them migrate from the reservoir. In 1985, biologists estimated that there were 527 (±59) westslope cutthroat trout in a 2.4 mile section of the Upper South Fork of the Flathead River near Black Bear Creek. In 1989, they estimated there were 416 (±83) westslope cutthroat trout in that area.

Biologists monitor the size of westslope cutthroat trout. They found that in the South Fork of the Flathead River near Young's Creek, the average length of such trout has ranged from 9.6 inches in 1988 and 1989 to 10.6 inches in 1986. They found that the percentage of westslope cutthroat trout greater than 12 inches long ranged from 11 percent in 1989 to 24 percent in 1986. (See Figure 19.) In addition, genetic tests made in 1989 showed these fish to be pure westslope cutthroat trout.

Over the years, 28 to 56 percent of the westslope cutthroat trout each year were greater than 10 inches long. Apparently, current angling regulations protect the population of westslope cutthroat trout.

Kokenee Salmon

The numbers of kokanee salmon in Flathead Lake and Flathead River have decreased dramatically. Biologists surveyed McDonald Creek in 1989, and counted only 20 kokanee redds. They also surveyed several mainstem Flathead River sites near Columbia Falls and counted only 22 redds. Surveyors at several Flathead lakeshore sites found no redds at all. Researchers have determined that the decline of kokanee salmon in the Flathead River system is related to the operations of Kerr and Hungry Horse dams, competition with *Mysis* shrimp, predation, and other factors.

The Montana Department of Fish, Wildlife and Parks and the Salish and Kootenai Tribes are experimenting with a kokanee salmon recovery program. Several million fry and fingerlings have been held until June and released in each of the last four years. Anglers have reported catching a few kokanee salmon. Also, biologists have found a few kokanee in the stomachs of lake trout. If the experimentally planted kokanee fry survive to maturity, biologists should start seeing spawning fish in the fall of 1991.

Hungry Horse Reservoir

Biologists have monitored Hungry Horse Reservoir's fisheries, elevation, water temperatures, and the depth of its sunlit zone since 1983. Their surveys indicate that the bull trout population in the reservoir increased in relative abundance until 1989.

Westslope cutthroat trout feed on insects and zooplankton. Fluctuating reservoir levels reduce the numbers of both food sources. Biologists are concerned because decreases in the reservoir's water level may affect westslope cutthroat trout more than bull trout.

Flathead Lake

Biologists annually monitored fish populations in Flathead Lake before 1988 using single-beam sonar equipment. Since then, biologists have surveyed the lake with more sophisticated dual-beam sonar equipment. This equipment improves the determination of fish sizes. In 1989, surveys indicated an average of 151.6 fish over one inch long per acre. From this, biologists estimated that there were 15.2 million fish over one inch long in Flathead Lake. This estimate did not include fish species which reside in shallow, shoreline areas of the lake (that is, westslope cutthroat trout, yellow perch, peamouth, squawfish, and suckers). Also, the estimate did not include the South Bay of Flathead Lake. The estimate mainly included deeper-water species such as lake trout, bull trout, and lake whitefish.

Fish density varied by depth and area. Surveyors found nearly one-third of the fish within the 32 to 50 foot depth range. This depth range includes the thermocline.

Biologists determined the relative abundance of fish species in 24 areas of the lake using capture nets and trawls. They used these samples to confirm the sonar estimates. Six to 28 percent of the off-shore fish communities were comprised of bull trout, 5 to 38 percent were lake trout, and 45 to 89 percent were lake whitefish.

The combination of dual-beam sonar sampling with confirmation netting and trawling will be a valuable tool for monitoring the changing fish population in Flathead Lake. Biologists will use these techniques annually to monitor the fisheries. This will help them evaluate the success of Flathead Basin fisheries' improvement efforts under the mitigation plans for the Kerr and Hungry Horse dams scheduled to be implemented in 1991.

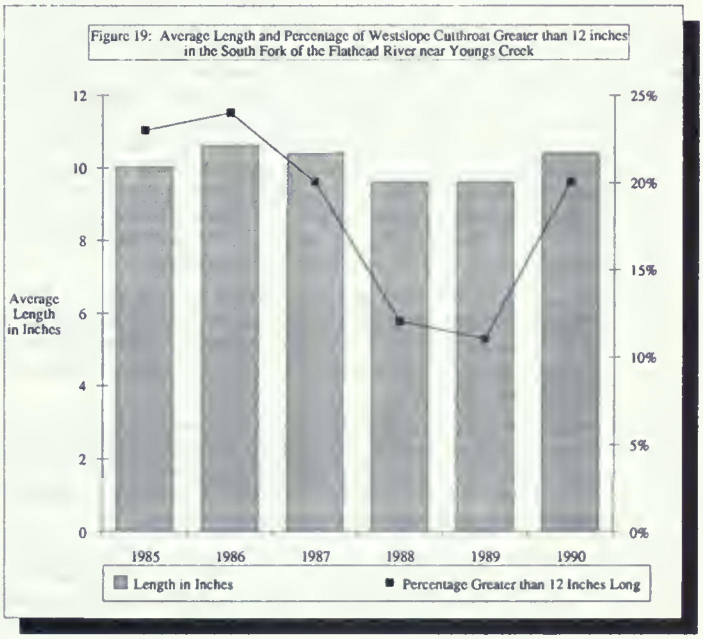


Figure 19: Average Length and Percentage of Westslope Cutthroat Greater than 12 inches
in the South Fork of the Flathead River near Youngs Creek

CONCLUSIONS

This report has not attempted to interpret thoroughly all the data in the water quality monitoring database. Rather, the researchers involved have identified and analyzed key findings. This is a progress report pertaining to the overall objective of monitoring water quality in the Flathead River Basin.

Much of the water in the Flathead River Basin drains out of pristine wilderness areas and Glacier National Park. Therefore it is not surprising that waters in the basin rank among the finest in the temperate regions of the world. Some of the lakes in Glacier National Park have the cleanest water reported in the scientific literature. In fact, Flathead Lake's water quality is ranked in the top ten percent for lakes of its size. In addition, the bull trout and westslope cutthroat fisheries are unique and valued assets of the Flathead River Basin. To protect this high quality water system, scientists must continually monitor various water quality variables.

Researchers found that Flathead River Basin waters remain very clean. They are highly suitable for a variety of purposes such as domestic use, irrigation, recreation, and the maintenance of trout fisheries.

The naturally low productivity of aquatic plants and animals in the Flathead River drainage is a result of the basin's high quality waters. Increases in productivity may indicate declines in water quality. However, water quality does change seasonally. Suspended sediments in water increase markedly during spring runoff — the water becomes cloudy and carries additional nutrients. These nutrients may temporarily increase the productivity of the plants and animals living in the streams and lakes of the basin.

A continuing controversy in the basin is the relationship between logging (with its attendant road building) and increased water, sediment, and nutrients in streams and lakes. Many studies in other forested drainages have shown that runoff erodes sediments from roads and log skid trails. This erosion can decrease water quality by increasing turbidity, increasing nutrient loads, and smothering aquatic life.

Scientists have developed computerized simulation models that show predicted increases over natural water yields in drainages of the Flathead River Basin as a result of logging practices. Sediment yield models suggest that the extent of logging and related activities, particularly road building on steep, unstable slopes, would yield abnormally large sediment loads in many of the basin's streams. Indeed, there is evidence that sediment loads on Coal Creek and other creeks have increased in relation to the intensity and duration of logging activities. On the other hand, monitoring data at other sites are either inconclusive or insufficiently analyzed to draw conclusions.

It is unlikely that land managers have built many miles of roads and extensively harvested timber in the Flathead River Basin without affecting water quality. However, it is difficult for researchers to relate cause and effect quantitatively because logging activities at many sites preceded water quality monitoring by 40 years or more and initial severe impacts may have long since flushed out. What is left may be a low baseline of impairment. Moreover, large numbers of samples in logged and control (pristine) drainages must be obtained over long time periods to detect water quality problems related to non-point source pollution that would possibly be derived from the diffuse effects of multiple logging activities and other disturbances (for example, fire) juxtaposed across the landscape. Researchers need to continue monitoring relationships between water quality and land uses within the basin in order to get a more quantitative understanding leading to improved management practices. A cooperative study between industry, management agencies, and university researchers on the effects of forest practices on water quality is presently nearing completion and may shed more light on this important issue. (See the section in this *Biennial Report* on the "Flathead Basin Forest Practices/Water Quality and Fisheries Study Cooperative.")

Whitefish Lake is on the threshold of becoming more eutrophic. It receives significant amounts of suspended sediments and phosphate nutrients. Many of these have eroded from the naturally unstable banks of lower Swift Creek. Currently, engineers are trying to find ways to stabilize some of these stream banks.

Is water quality in Flathead Lake changing? The chemical environment of the lake has not altered much over the years. However, Flathead Lake is at a critical threshold. If the concentration of nutrients in the lake increases, water quality may deteriorate suddenly. For example, increased nutrients might initiate lake-wide blue-green algae blooms.

The Flathead Basin Commission and the Water Quality Bureau have initiated programs for reducing nutrient concentrations. For example, Lake and Flathead counties have enacted phosphate detergent bans and Kalispell is implementing improvements in its sewage treatment plant which will help Ashley Creek. However, researchers have not identified any clear-cut trends showing a decrease in dissolved nutrient concentrations. Does this mean that the nutrient reduction programs are not working? Have other sources of nutrients (for example, groundwater pollution) offset the reductions in nutrient loads resulting from these programs? Researchers believe the nutrient reduction programs are working. However, the nutrient reduction programs have not been in place long enough for the effects to be seen.

The average clarity of the water column in Flathead Lake continues to increase somewhat. This is happening even though slightly more phytoplankton are being produced. Also, the food web in the lake has changed since *Mysis* shrimp were introduced. The ramifications of their presence may continue for many years.

Fisheries data collected under the Flathead River Basin Environmental Impact Study and continued under this monitoring plan have documented the importance of the unique fisheries habitats and populations in the Flathead Basin. Tributaries to the Flathead and Swan lake and river systems support what is probably the largest migratory population of bull trout in the world. The system also supports one of the most important, genetically pure, westslope cutthroat populations. These fish are valuable, unique, and a vital part of the ecological integrity and quality of life in the system. Biologists need to continue monitoring fish populations in the Flathead River Basin.

Monitoring information has shown that the quality of fish habitats in some portions of the Flathead Basin has been reduced moderately. For example, the quality of Coal Creek streambed gravels in the North Fork Flathead drainage is only marginally acceptable for bull trout spawning and rearing. Overall, during the eleven-year period of record, measurements of juvenile bull trout abundance and surveys of bull trout spawning sites have indicated a relatively stable bull trout population. Trout populations declined dramatically before this intensive monitoring program began. The construction of Hungry Horse Dam blocked the path of migrating fish from Flathead Lake to the South Fork of the Flathead River. This may have eliminated nearly 40% of the westslope cutthroat and bull trout spawning runs from Flathead Lake. In addition, past forest practice activities may have reduced populations. Therefore, researchers must closely monitor the bull trout and westslope cutthroat trout populations to note any further declines.

Westslope cutthroat spawning sites are very difficult to survey because these fish spawn during spring runoff. However, by measuring the abundance of young fish in tributaries, biologists have determined that the population is relatively stable. The size and numbers of westslope cutthroat trout in the upper South Fork of the Flathead River appear to have increased. This may be a response to the more restrictive fishing regulations imposed in 1984.

The fishery in Flathead Lake is changing in response to fluctuations in the numbers of *Mysis* shrimp. Biologists planted several million kokanee salmon in the lake each year from 1987 through 1990 to test the possibility of recovering the population. In addition, they are trying approaches to mitigate the effects of the operations of both Kerr and Hungry Horse dams on the Flathead River system fisheries.

WHAT NEXT?

The agencies identified in the "Master Plan for Monitoring Water Quality in the Flathead River Basin" must continue to cooperate with the Flathead Basin Commission in the monitoring of water quality variables and other activities. Scientists from the various agencies must continue to work together to analyze the cumulative effects of forest development and other activities on water quality and the fresh-water ecosystem. They need to determine trends in the data and to distinguish between natural and human-caused sources of water pollution.

The Montana Department of State Lands, the Montana Department of Fish, Wildlife and Parks, the Water Quality Bureau of the Montana Department of Health and Environmental Sciences, and the United States Forest Service plan to continue monitoring and collecting baseline water quality data.

Various public and private organizations have been implementing state-of-the-art "Best Management Practices." Forest managers hope that when they use Best Management Practices there will be minimal impacts of such practices on water quality, fisheries, and drainages. By monitoring how these Best Management Practices have been applied, researchers may be able to determine how effective the practices have been in protecting water quality.

The food web in Flathead Lake remains unstable and nutrient loads in the lake are at a threshold level. Researchers predict that over the next few years a number of human and natural events will combine to significantly affect water quality. For example, Kalispell will put the new sewage treatment plant into operation. Also, lake levels may not fluctuate as much as a result of hydropower impact mitigation at Kerr and Hungry Horse Dams. In addition, the present water quality database is dominated by years in which precipitation in the area was below the long-term average. If precipitation increases, it will affect water quality.

Water quality monitoring of Flathead Lake and its tributaries should be continued and expanded. For example, researchers need to increase their understanding of the spatial variation of water quality variables in the lake and in precipitation on the lake surface. However, the costs of obtaining the routinely collected data have increased. The Flathead Lake Biological Station will need additional funding just to continue to meet the objectives for Flathead Lake as specified in the "Master Plan for Monitoring Water Quality in the Flathead River Basin."

Researchers must monitor key fisheries variables at important sites tc evaluate the basin-wide goal of protecting aquatic resources. The Montana Department of Fish, Wildlife and Parks will require funds to continue the fisheries monitoring program at its present level.

The "Master Plan for Monitoring Water Quality in the Flathead River Basin"was designed to be interactive and subject to adjustment upon periodic evaluation. Biologists recommend continued monitoring of many priority sites, changing priority on some sites, adding some new sites, and dropping some sites from the program. These sites are listed below.

In the North Fork drainage, Trail Creek, North Fork Coal Creek, and Big Creek are designated as priority sites. Because of the importance of Whale Creek and the main Coal Creek for bull trout spawning, this site should be upgraded to a priority site.

Challenge Creek and Granite Creek are currently designated as priority sites in the Middle Fork drainage because of their importance for juvenile cutthroat and bull trout spawning, respectively. Morrison Creek should be a priority site because of its importance for bull trout spawning.

In the Stillwater drainage, the "Master Plan"calls for fisheries monitoring at three sites. Monitoring of fisheries' variables will continue only on Whitefish Lake. Incomplete data sets on the other two sites limit any interpretations that researchers could make.

Biologists recommend upgrading to priority sites Goat, Elk, Squeezer, and Lion Creeks, all tributaries of the Swan River. These streams support the majority of all bull trout spawning in the Swan River drainage and are extremely important to this species of special concern. Also, a good data record exists for these streams.

In the mainstem Flathead drainage, fisheries sampling on Flathead Lake is a priority and should remain so. Drastic declines in the numbers of kokanee spawners has changed biologists' efforts to monitor spawning areas along the Flathead River. These areas will be monitored closely only if aerial counts reveal a significant kokanee spawning run in the river system.

The individuals from the agencies which cooperate to monitor water quality recommend that all land managers apply, or continue to apply, Best Management Practices in the development of forestry lands.

The members of the water quality monitoring committee feel that their efforts are critical to the preservation of the basin's relatively pristine aquatic environment. They encourage the participation of other public and private agencies and organizations in their efforts to protect the Flathead River Basin's fresh-water ecosystem by monitoring changes in its water quality.

FBC Priorities For 1991-1992

What will be the future water quality issues in the Flathead? The Basin Commission held a workshop to prioritize some of its future activities.

FUTURE FLATHEAD ISSUES: The FBC Will Be Involved

On a warm and muggy June 27, 1990, the Flathead Basin Commission held a retreat at Lone Pine State Park at Kalispell. The purpose of the retreat was two-fold: to take a critical self-examination of internal Commission issues, and to establish a vision for future basin issues and possible Commission involvement.

Several concerns surfaced during the discussion of future FBC activities, and what follows is a sample of the issues the Commission will closely monitor.

- The Montana Department of Natural Resources and Conservation 1989-1990 cycle of State Water Planning process has addressed drought management and water storage. It is expected the next Water Planning Cycle will emphasize water quality, including both surface water and groundwater. The "building" of 1991-1992 water plan may start with public forums in early 1991. The Commission will actively participate in these forums and strongly recommend that a citizen member of the Commission be appointed to serve as a member of the State Water Plan Advisory Council.

- The Crown of the Continent Project proposal calls for the creation of an innovative scientific and educational institution to initiate, coordinate, interpret and disseminate scientific research into the interconnections and interactions of the Crown of the Continent Ecosystem and its linkages with the local human communities and the human economy.

By achieving an understanding of the inter-relationships which determine ecosystem integrity and the linkages with a sustainable human economy, the Crown of the Continent would delineate a unique ecological/economic couplet capable of serving as a prototype with the capacity to significantly inform national and international resource policy leaders.

We will continue our close relationship with the originators of the project, whose concepts we have endorsed.

- The Bureau of Reclamation, Army Corps of Engineers and Bonneville Power Administration (BPA) are engaging in a System Operation Review, which considers water management issues for federal projects on the Columbia River, primarily 14 major dams. This public review process is intended to result in regionally acceptable decisions on balanced uses of the river and allow federal agencies to renew or renegotiate key agreements regarding operation of the dams. The FBC will monitor the SOR process for impacts on the Flathead Basin that may result from various Columbia River operational decisions.

- The Pacific Northwest Electric Power Planning and Conservation Act of 1980 authorizes "a program to protect, mitigate and enhance fish and wildlife" to compensate for losses attributable to the federal hydropower system. A wildlife trust agreement between BPA and the Montana Department of Fish, Wildlife and Parks (MDFWP) has provided for wildlife mitigation and enhancement related to the Hungry Horse and Libby hydroelectric facilities. The MDFWP is currently developing a resident fish mitigation program for the Hungry Horse project and will be pursuing one for the Libby project.

These activities all provide an opportunity for public involvement by interested groups. The FBC will continue to monitor these activities and provide input to the various agencies as appropriate.

- Kerr Dam, at the outlet of Flathead Lake, is operated under a license from the Federal Energy Regulatory Commission by Montana Power Company. The Kerr License also requires mitigation of fish and wildlife losses. MDFWP and the Confederated Salish and Kootenai Tribes are the lead agencies in the development of mitigation plans for this project.

Because of the potential impacts to the Flathead Basin ecosystem by operations of the Kerr facility, the Commission will, to the extent appropriate, provide input into the development and implementation of fish and wildlife mitigation plans for this facility.

- The Confederated Salish and Kootenai Tribes have adopted a Tribal Water Quality Management Ordinance to protect, restore, and maintain the quality of the water resources for the Flathead Reservation. Since the Reservation is a part of the Flathead Basin, the Commission will monitor, to the fullest extent possible, the development of regulations, standards, and plans to implement the ordinance.

> "The Commission. . . will strongly recommend that a citizen member of the Commission be appointed to serve as a member of the State Water Plan Advisory Council."

THE NORTH FORK: A Zone of Cooperation

As articulated in a previous section of this report, the FBC is actively pursuing cooperation between Montana and British Columbia for coordinated land management in the North Fork area.

To accomplish this positive land management coordination, the Commission will continue its efforts to facilitate a bilateral agreement between governments. For future and consistent action, the FBC will:

1) Request that Governor Stephens formally establish a working group and chair for the U.S. which includes FBC representation (Marx, Sorensen, Wilson).
2) Ask the governor to request Premiere Vander Zalm to formally establish a working group and chair for Canada, and to give the authority to begin consultations on the IJC recommendation.
3) Encourage more Canadian participation at the North Fork Interlocal meetings on the North Fork.
4) Make a stronger effort in advocating Canadian attendance and participation in FBC meetings.

PUBLIC EDUCATION: A Continuing FBC Commitment

One of the primary goals of the Flathead Basin Commission is to promote public awareness for the need to maintain water quality. This is an ongoing program which includes a multitude of informational formats: major workshops, slide shows and video programs, brochures, and speakers, as well as sponsoring public meetings so that interested citizens can be heard.

The FBC has facilitated public education on a number of issues including the Whitefish Lake oil spill, and an all-day workshop on comprehensive planning. These two issues are connected, yet different: the first deals with governmental reaction to an emergency, and the latter deals with how the public as well as government can plan for the future.

The Commitment Continues:

In order to carry out the public education program the Commission is committed to using a portion of its state-provided budget. In addition, the FBC has solicited private sponsors which range from donated use of public buildings to a grant of $3,000 from private industry to fund the workshop and print a followup brochure for public distribution.

The area of public education/awareness is envisioned by the Flathead Basin Commission to be a growing function of the Commission as it continues its involvement in water quality monitoring, the water quality/forestry cooperative, subdivision reform, economic development, interagency cooperation, tribal water quality ordinances and a host of other water quality related issues which will affect the Flathead Basin into the next century.

In-the-field technical research is a cornerstone of FBC monitoring efforts.

HAZARDOUS MATERIAL: FBC Seeks Action

The Whitefish Lake oil spill had several lasting impacts on the Flathead, and one of those impacts was a realization that we must be better prepared for hazardous waste spills.

As a result of this realization, the community has mobilized an action group named the Hazardous Materials Committee. Composed of members of the FBC and others, the Committee's mission is to oversee and coordinate a public participating process to enhance preparation and response to hazardous waste spills. It is envisioned that a chairman of this committee would serve on the Local Emergency Planning Committee which is chaired by the director of the Department of Emergency Services for Flathead County.

Continuing Issues:

1) Hazardous materials moving through the Flathead Basin via the transportation systems: (Railroad, Trucks, etc.)
2) Maintaining a plan in the Flathead Valley to react properly and promptly to hazardous materials spills which would limit as much as possible waterway environmental damage.
3) Oversee public involvement process and ensure proper planning methods to control and mitigate the high risk potential of introducing hazardous materials.

BASIN COMMISSION FUNDING: Local Support Sought

The FBC has a current general fund budget of approximately $38,600 per biennium. This funding retains staff support in the Kalispell office, plus funds for administrative costs, publications (brochures), and special projects such as the monitoring program, planning workshop and continuance of the public education program.

At present, the salaries of the Executive Director and Program Manager are paid as members of the Governor's staff. Flathead County has contributed space for our Kalispell office.

Funding Needs:

The FBC must establish a more stable and increased budget to carry out the initiatives it has deemed necessary to meet its duties. The immediate need is to obtain the funding necessary to continue support staff in the Kalispell office. The FBC currently has a contract with the Freshwater Foundation (FWF) to retain current support staff until January 1991. The cost is about $1,500 per month. The FBC has notified the FWF that we will not continue our contract with them when it expires, unless other funding outside our state appropriation is obtained.

Another pressing need is the FBC's planning initiative. In September, the FBC conducted a community workshop to kick-off the initiative. We were successful in obtaining local support from the Flathead Lakers, Columbia Falls Aluminum Company, and Flathead County to cover the direct costs of the workshop, but full implementation of the initiative is not possible without grant funding or other outside monies.

The FBC also oversees a water quality monitoring program for the Flathead region. This program is coordinated by the Flathead Lake Biological Station and participants include DHES, several resource agencies on national, state and local levels. The estimated total cost of the program is $225,000. Funding for the Flathead Lake limnology portion of the program has been facilitated by the FBC and participants include DHES Water Quality Bureau, Flathead County, Lake County, Confederated Salish and Kootenai Tribes, Montana Power Company, and the U.S. Bureau of Reclamation. The total cost is $48,000 a year, and some funding has been jeopardized by budget shortfalls. This year Lake County may not be able to contribute.

Conclusion:

The FBC will become more aggressive in securing funding for its office operations, planning initiative, and monitoring program. With state and local government budget shortfalls expected, funding efforts will center on private sources. The FBC is developing a specific and focused strategy to seek the necessary funding from both local sources and outside foundations.

Specific actions steps include:

a) Lobby state legislature to maintain current level of state funding.

b) Prepare a needs assessment for the operation of the Kalispell office — eliminate all unnecessary spending — and meet with local business leaders to seek funding support on a continuing basis.

c) Identify potential funding sources, both local and outside the Flathead Basin, for the planning initiative.

d) Prepare funding requests for the initiative and meet with the organizations identified above.

e) Identify monitoring plan funding needs for the Flathead Lake portion of the Master Water Quality Monitoring Plan, and meet with the responsible agencies to obtain the necessary funding.

The funding priority will be carried out by the Executive Committee but the FBC's program manager will take the lead on carrying out the action items.

SEWAGE TREATMENT FACILITIES: Grants Should Be Continued

Over the last few years many communities in the Flathead Basin have improved their sewage collection and treatment systems. Much of this work has been accomplished with help from the federal Construction Grants Program administered by the Montana Department of Health and Environmental Sciences. One of the most recently approved projects will serve Evergreen, an unincorporated area of approximately 5,000 residents located adjacently east of Kalispell. The development of this project began over ten years ago and is an example of how long and controversial the path to rural sewer improvements can be.

Perhaps the primary factor which finally led to approval of the Evergreen project is impending termination of the federal Construction Grants Program. This particular federal program began with passage of the Clean Water Act in 1972 and has provided over $200 million dollars to fund construction of 149 projects in Montana. Under this program the funds have been distributed on the basis of a priority system which allowed available funds to be spent where they could do the most good with respect to environmental improvement. This favored the larger municipalities and more concentrated rural areas. Now, coincident with elimination of the grants program, government entities are beginning to deal with problems in less densely populated areas which are more expensive on a cost-per-user basis.

The result is a double whammy: higher cost and no grant. Many of the areas which are in dire need of sewage collection and treatment systems will just not be able to come up with required funds. This is particularly true in areas which are faced with other mandatory federal requirements such as those in the Safe Drinking Water Act. Direct and immediate protection of public health through provisions for safe drinking water is undeniably a higher priority than more indirect protection through sewage collection and treatment. It should be noted, however, that failure to deal with sewage problems now will result in contamination which will have to be dealt with, at much greater cost, at some point in the future. Efforts to secure continued availability of grants to assist construction of sewage collection and treatment systems in small communities and rural areas will be a priority of the Flathead Basin Commission over the next biennium.

COMMUNITY PLANNING: The Time Is Now

Land use is an important aspect in protecting Flathead waters, and as mentioned earlier in this report, the FBC has undertaken a major land-use planning initiative.

In this regard, the Commission believes it is essential to:

a) implement the two-year land planning initiative already approved by the Commission.

b) increase public participation in planning and community processes and activities, as well as their understanding of them.

c) Present results of September 26 forum to elected officials, other organizations and the public.

In addition to the above objectives, the FBC developed six specific action steps to accomplish these goals.

a) Submit grant proposals and requests to funding agencies in support of the planning initiatives.

b) Develop fact sheets for use at meetings which detail:

— the economic savings of good planning;
— case studies of recent situations in the Flathead (good and bad); and
— case studies of situations and costs in places outside the Flathead Basin.

c) Develop a public outreach program and schedule further discussions of planning and citizenship initiatives.

d) Work more closely with elected officials to assure communication.

e) Promote and/or establish citizen roundtables within the basin.

f) Identify key individuals within the community who can serve as citizen advisors to the Commission and represent viewpoints perhaps not represented on the Commission.

The FBC has no authority to mandate improved land-use planning in the Flathead, but the Commission does have the ability to elevate the issue and mobilize the community to take firm, determined action to improve planning efforts in the basin.

Two years from now, in the Commission's next biennial report, the FBC hopes to report on significant accomplishments on this issue.

MONITORING: An Essential Mission Of The FBC

Monitoring of water quality has been and will continue to be one of the most important priorities for the Flathead Basin Commission. The only way to identify problems and to devise and measure the effect of corrective activities is through a well planned and supported monitoring program.

Throughout its history, the Commission has supported monitoring efforts by encouraging member agencies and direct funding for specific projects. The results of monitoring efforts have included such things as modification of agency programs and practices, and creation or improvement of pollution control laws. Probably the greatest payout has been in improved understanding and appreciation by the general population of the need and value of high quality water.

Over the next biennium encouragement and support by the Commission for water quality monitoring should continue with the following as primary objectives:

- Continued evaluation of improvements related to the phosphorous ban.
- Increase in the monitoring of groundwater quality.
- Further identification of impacts related to lakeshore development.
- Evaluation and improvement of forest Best Management Practices.

FBC PLEDGE: Cooperation and Communication With The State Legislature

The statutory mission of the Flathead Basin Commission is to protect water quality in the Flathead Basin, and the Commission is prepared to support legislation which accomplishes this goal.

In preparation for the 1991 legislature, the Commission discussed its legislative priorities and the method of building political and public support for these priorities.

Pre-Session: Building Support

In addition to continuing its successful public education program, in early 1989 the FBC began an ambitious community planning initiative. This initiative, based on the realization that our water quality, our quality of life and our economic well being can be profoundly impacted by the choices we make now as a community, received considerable media attention and public support. To build from that early support and create positive momentum, the Commission sponsored a workshop designed to build increased community awareness and commitment toward planning.

Legislators were kept informed of the Commission's progress, received special information packets detailing the initiative, and many elected officials attended the workshop.

Also, this biennial report is specifically created by the Commission for the legislature, and Flathead-area legislators will be further briefed by Commission members about this report's priorities and contents.

Finally, the Commission hosted a pre-legislative session dinner for all Flathead-area legislators to establish and strengthen political ties and support.

Because of its commitment to water quality and its role as a facilitator to stimulate community problem-solving, the FBC enjoys bipartisan support from area legislators. Bolstered by that legislative support, and encouraged by strong community approval, the Commission is poised to play an active and positive role on water quality issues during the 1991 legislature.

1991 Session: FBC Activity

The Commission will monitor the legislature and remain in close contact with Flathead-area legislators. While the Commission has no specific or "in-house" legislative agenda, several issues which may surface during the session are of critical importance to the FBC.

Montana subdivision law may be modified, and the Commission's planning initiative has uncovered deficiencies in laws governing subdivision development in Montana. It is uncertain at this time what approach may be used by the legislature, but the Commission will watch such legislation with keen interest and participate in the legislative process when appropriate.

The Commission will also support legislative efforts to improve and modernize waste water treatment facilities in the Flathead area.

Also, the Commission will closely monitor legislative efforts to improve emergency responses to hazardous waste spills in Montana. Whitefish Lake was victimized by a diesel spill in early 1989, which heightened awareness of hazardous waste response responsibility.

Timber and forest management will almost certainly be subjects of discussion — and debate — by the legislature. The Commission, through its "Forest Practices/Water Quality & Fisheries Cooperative" has conducted extensive research into the relationship between timber cutting and water degradation. The Cooperative will conclude its research with a series of reports and informational presentations in mid 1991.

In addition, the Commission will support efforts to continue and improve the public involvement process established under the Montana State Water Plan process. The Commission has expressed an interest in participating more fully in the creation of Montana's water plan, and Governor Stephens has given preliminary indications he will appoint a Commission member to the State Water Plan Advisory Council.

Also, if state legislative action would be either necessary or beneficial, the Commission would support legislative action to endorse or codify the efforts by the State of Montana and British Columbia to establish a "zone of cooperation" in the North Fork area of the Flathead River. While official legislative involvement is not imminent, the legislature — as well as the U.S. Congress — should recognize the importance of the ongoing discussions between Montana and British Columbia.

Finally, the Commission supports a level of state appropriation which enables the FBC to carry out its mandatory mission of Flathead-area water quality protection. The Commission received $39,736 in the 1989-90 biennium, and believes a decrease in that level would hinder its ability to effectively accomplish its statutory responsibilities.

As a final note, it is the Commission's intention to involve as many Commission members as possible in decisions impacting legislative activity. The Commission is composed of 21 dedicated individuals committed to improving the quality of life in the Flathead: all these individuals will play the major role in Commission activity during the legislative session.

FBC BUDGET REPORT

The Flathead Basin Commission receives an annual appropriation from the Montana legislature, and has actively sought additional funding sources as well. The information below outlines how much funding the FBC received, and where that funding was allocated, through November 30, 1990.

Funding Sources 1989-90

State General Fund Appropriation	$ 37,736
Contributions received:	
Columbia Falls Aluminum Company	$ 2,000
Flathead Lakers	$ 1,000
Flathead County	$ 500
Total Funding	$ 41,236

Funding Allocations 1989-90

Freshwater Foundation (contracted services: secretarial support, brochure development, grant writing, technical consultation, fundraising and FBC participation and involvement)	$ 21,500
1989 Funding Returned to General Fund	$ 1,294
Brochure Printing	$ 1,500
Letterhead & Envelope Printing	$ 277
Workshop Announcement Printing	$ 788
Advertising for Program Manager	$ 781
FBC-Approved Travel	$ 862
Meeting Room & Equipment Rent	$ 156
Office Supplies	$ 310
Postage	$ 66
Total Allocations	$ 27,534
Current Balance for Remainder of Fiscal Year (Through July 1, 1991)	$ 15,705

Projects Approved Through July 1, 1991

Biennial Report (est)	$ 6,000
Workshop Follow-Up Material (est)	$ 1,200

FBC RESOLUTIONS

RESOLUTION 1-90

ENDORSEMENT INTERNATIONAL JOINT COMMISSION REPORT ON CABIN CREEK

Approved by Flathead Basin Commission Vote on: 31 May, 1990

WHEREAS, the proposed development of a coal mine by Sage Creek Coal Limited (Canada) located on a headwater tributary of the Forth Fork of the Flathead River was perceived as a threat to water quality of the Flathead Basin water; and

WHEREAS, the protection of water quality and aquatic life are essential to the people of Montana and to the mission of the Flathead Basin Commission; and

WHEREAS, a statutory duty of the Commission is to encourage and work toward international cooperation between the governments of British Columbia and Montana on issues affecting Flathead waters; and

WHEREAS, the potential impacts of developing proposed Cabin Creek Coal Mine were referred to the International Joint Commission (IJC) for study in 1985; and

WHEREAS, the IJC appointed a bilateral Flathead River International Study Board to examine the potential impacts of the proposed mine; and

WHEREAS, the Study Board was composed of State, Provincial and Federal technical personnel possessing broad multi-disciplinary natural resource expertise; and

WHEREAS, the Study Board and the IJC have published reports opposing development of the coal mine because of water quality degradation at the mine site itself and at the U.S./Canadian border, and water quality violations would reduce the bull trout fishery in Montana which in turn would violate the Boundary Water Treaty of 1909; and

WHEREAS, it is important that State, Provincial and Federal governments on both sides of the U.S./ Canadian border accept the recommendations of the IJC and begin cooperative formulation of mutual policies designed to protect the water resources of the North Fork of the Flathead River and other Flathead Basin waters;

THEREFORE, BE IT RESOLVED that the Flathead Basin Commission strongly endorses the IJC report and will communicate encouragement to State, Provincial and Federal governments to formally accept and approve the IJC report.

RESOLUTION 2-90

SUPPORT FOR CROWN OF CONTINENT PROPOSAL

Approved by Flathead Basin Commission Vote on: 31 May, 1990

WHEREAS, the development of our natural resources in the Flathead Basin and throughout our environment can have a direct impact on our quality of life and may impact Basin water quality; and

WHEREAS, it is essential that elected officials, decision-makers, governmental officials and the public have immediate access to the broad-based range of accurate, timely technical information sources on natural resource data; and

WHEREAS, it is especially important that we as a society understand the relationship of ecosystems and the Glacier National Park area ecosystem in conjunction with the delicate balance of economic development and environmental protection; and

WHEREAS, the Crown of the Continent proposal, as advanced by George Darrow, Jack Stanford, Gil Lusk and Ed Brannon, seeks to provide scientific and technical information important to the environmental and natural resource management concerns shared by the public and scientific community; and

WHEREAS, Federal, State and private management of our natural resources has been the cause of controversy in the Flathead Basin, and a major mission of the Flathead Basin Commission is to assist in providing solutions to these controversies; and

WHEREAS, the "Crown" proposal, if realized, could provide a data base of unbiased technical information which could be utilized to resolve natural resource problems and stalemates;

THEREFORE, BE IT RESOLVED that the Flathead Basin Commission endorses the concept of the Crown of the Continent proposal and will communicate such support to the Governor and Montana Congressional Delegation.

RESOLUTION 3-90

SUPPORT PUBLIC INVOLVEMENT IN GOVERNMENT DECISION-MAKING

Flathead Basin Commission

Approved by Commission Vote on: 26 November, 1990

WHEREAS, The Montana State Constitution and Montana State statutes, including the Administrative Procedures Act and Montana Environmental Policy Act, provide for public notification and involvement in state government decision-making; and

WHEREAS, Federal, state and local governmental entities have legal authority to make decisions which can greatly impact the water quality in the Flathead Basin; and

WHEREAS, the Flathead Basin Commission is a non-regulatory entity fully committed to public involvement and public participation in the protection of the Flathead Basin aquatic system with compatible economic development in the Basin; and

WHEREAS, the Flathead Basin Commission meets on a regular basis in an open and public manner in an effort to inform Basin residents on water quality issues and create processes which lead to responsible and effective governmental decision; and

WHEREAS, governmental officials benefit from public comments and concerns expressed from public groups and individuals;

THEREFORE, BE IT RESOLVED the Flathead Basin Commission strongly encourages full public disclosure and public involvement in resource development decisions and governmental actions which may impact the water quality of the Flathead Basin.

RESOLUTION 4-90

ENDORSEMENT OF BASIN WIDE COMPREHENSIVE PLAN

Flathead Basin Commission

Approved by Commission Vote on: 26 November, 1990

WHEREAS, the purpose of the Flathead Basin Commission is to protect the high quality of the basin's aquatic environment; and

WHEREAS, the use of the land drained by these waters has a direct impact on water quality; and

WHEREAS, the concept of land use planning is a method of directing the future use of developable property; and

WHEREAS, when improper land use is permitted a significant potential for reduced water quality exists; and

WHEREAS, economic health can be facilitated and encouraged by the identifying of the developable sites and coordinating uses;

THEREFORE, BE IT RESOLVED that the Flathead Basin Commission endorses the development, implementation and compliance with a basin-wide comprehensive land use plan, that will protect water quality and encourage orderly and efficient economic growth.

FLATHEAD BASIN COMMISSION

Kalispell artist Mark Ogle, a native of Helena whose career in art began 20 years ago, is one of Montana's most respected young talents. His oils and watercolors are in the private collections of celebrities like Clint Eastwood and Robert Redford and form part of many corporate collections, both in the U.S. and in several foreign countries. His special interest is the wildlands of the West, specifically our National Parks. Ogle's paintings of scenes in Glacier and other parks have won him national acclaim. This portrait is a detail from Ogle's oil painting, "December Morning." The work depicts Glacier National Park's Mt. Edwards.

The Flathead ours to enjoy… and manage

FLATHEAD BASIN COMMISSION

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FOR IMMEDIATE RELEASE
February 11, 1991

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FLATHEAD BASIN COMMISSION BIENNIAL REPORT AVAILABLE

A report documenting the 1989-1990 activities of the Flathead Basin Commission, including the Commission's water quality monitoring efforts and land-use planning initiative, has just been published.

The 52-page 1989-1990 Flathead Basin Commission Biennial Report details recent Commission activity and provides insight about future issues of interest to the Commission.

As stated in the Executive Summary of the report, "The recent biennium was a challenging, rewarding, active and successful period for the FBC. It was...a time of transition, a time of growth, and a time of accomplishment."

The report chronicles the Whitefish diesel spill, the International Joint Commission's decision on the Cabin Creek Coal Mine in Canada, overall water quality in the Flathead, the FBC planning initiative and the FBC's Forest Practices/Fisheries/Water Quality Cooperative Program. In addition, the Commission sets an agenda for priority issues in the future, including bilateral land management cooperation in the North Fork of the Flathead River, improvements in sewage treatment facilities and hazardous spills response.

The Basin Commission is a 21-member nonregulatory organization created by the 1983 legislature to monitor and protect water quality in the Flathead Basin. Commission membership includes federal, state, county and tribal government representatives, local citizens and the Governor's office.

Copies of the report are available by contacting Mark Holston in the Commission Kalispell office at 752-0081 or Glenn Marx in the Governor's office at 444-3111.

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500 copies of this public document were published at an estimated cost of $8.40 per copy, for a total cost of $4,200.00 which includes $4,200.00 for printing and $.00 for distribution.